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THE NATURALIST

A Quarterly Journal of Natural History for the North of England

Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

PLANNING AND NATURE CONSERVATION

Many Local, and other, Authorities are now producing local plans, subject plans, etc, and the Yorkshire Naturalists' Union is often informed of them at a public consultation stage when they are still in draft form. It was agreed recently by the Y.N.U. Executive that the Administrative Officer, to whom these drafts are sent, will check with any local societies to ensure that they have been consulted, and will forward the documents if necessary for analysis and comment.

It is the Union's policy on nature conservation matters to give support to Affiliated Societies, and such Societies may wish to seek relevant information from the Y.N.U. Recorders and other experts.

Close liaison between the Union and the Yorkshire Naturalists' Trust on all nature conservation matters is essential, and it is particularly useful where plans or proposals affect a large area of the county, involving the areas of many local societies. It is most helpful to the nature conservation case if all bodies making representations on its behalf can agree and present a united front to safeguard the wildlife interest.

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THE YORKSHIRE NATURALISTS' UNION

H.R.H. The Duchess of Kent
Patron of the Yorkshire Naturalists' Union

Our Patron, H.R.H. the Duchess of Kent, G.C.V.O., Ll.D., who is Chancellor of Leeds University, maintains many other links with her home county and we are honoured to be one of those organizations with which she is associated.

One of her visits to Yorkshire was on 10 February 1981 to open the Piece Hall at Halifax, and it was on this occasion that Miss Margaret Hartley, Chairman of the Union's Executive, was presented to Her Royal Highness.

Later in the year an invitation was received for four members of the Y.N.U. to attend a Royal Garden Party at Buckingham Palace on 21 July when the Duchess herself would be present so that they could meet her in person. The Business Committee selected the President, Mrs Joan Appleyard who joined in 1946; Dr and Mrs W. A. Sledge, members since 1923 and 1961, and Mrs Joan Duncan, joined 1946. It was a very special event for the Union's representatives and the occasion was rendered all the more enjoyable by the fineness and warmth of the weather.

The Duchess shows a real understanding of the aims of the Y.N.U. and she has expressed her concern for nature conservation. We much appreciate her interest in natural history in general and in the work of the Yorkshire Naturalists' Union in particular.

MARKS HILL NATURE RESERVE

Marks Hill Nature Reserve lies on part of a low ridge of London clay capped with sandy deposits of the Claygate beds on the outskirts of the new town on Basildon in south-east Essex. In the eighteenth century there was a strip of woodland on the clay called Marks Hill Wood and another small wood called Well Wood on the sand; both had been managed as coppice with standards from time immemorial. Marks Hill Wood is unusual as the trees coppiced were hornbeam *(Carpinus betulus)* and Service tree *(Sorbus torminalis)*; in Well Wood they were mostly hazel. The rest of the area now included in the Nature Reserve was arable farmland. In the late nineteenth century the coppice became neglected and the agricultural land was converted to pasture. In the twentieth century between the two world wars an unusual type of property speculation developed in this part of Essex. At Marks Hill two roads with grandiose names (Albermarle Road and Gladstone Road) but which were little more than tracks and were practically unmetalled were put in and the land was cut up into small plots. People from urban backgrounds with very little money pursued the dream of an idyllic country life by putting up ramshackle dwellings without mains water, electricity or gas, or proper drainage, and the place became a rather diffuse shanty town. By mid-century the aspirations of the citizens of a more affluent society could no longer be met in the bungalows of plotland, as it had come to be known. They took up a new life in the new town, and plotland went back to nature. It is remarkable how traces of occupation have come near to obliteration. The roads can just be made out on the ground, but it is almost as if the dwellings had never been. Much of the woodland still exists, and is now managed as coppice with standards again. The rest is being partly maintained as scrub and partly as rough grassland. The work of management is carried out by members of the Basildon Natural History Society with support from Basildon Corporation.

On 21 May 1981 in very inclement weather the Reserve was formally opened by Gordon Beningfield, the naturalist and artist. He is the designer of the 1981 set of commemorative postage stamps portraying British butterflies. He has also published a book of reproductions of his paintings of rural scenes entitled *Beningfield's Countryside* (London: Allen Lane, 1981; pp 141, illustrated in colour; price £7.95). The accompanying text is rather slight, although he stresses very clearly the need for conservation; he seeks a broadly based, informed public awareness rather than sporadic action by emotive pressure groups. The paintings have a delicate charm, in some cases verging on the sentimental, but in total they present a memorable impression of a countryside we are in danger of losing altogether.

FHB

FIELD NOTE

Occurrence of *Marstoniopsis scholtzi* (Schmidt) in Yorkshire

I recently (5.10.81) found numerous specimens of the freshwater gastropod *Marstoniopsis scholtzi* (Schmidt) (= *Bythinella scholtzi* (Schmidt)) in the vicinity of Fountains Abbey, N. Yorkshire (SE 271683). These were on algal-covered stones in a small artifical stone cistern into which water was running. No other gastropods appeared to be present. There appear to be no previous records of this species from Yorkshire; Kerney (1976) and Macan (1977) record it only from canals near Manchester and from a timber dock in Grangemouth (Stirling).

Kerney, M.P. (1976) *Atlas of the Non-marine Mollusca of the British Isles*. Conchol. Soc. Great Britain and Ireland.

Macan, T. T. (1977) *A Key to the British Fresh- and Brackish-water Gastropods*. 4th Edn. Freshwater Biol. Assoc.

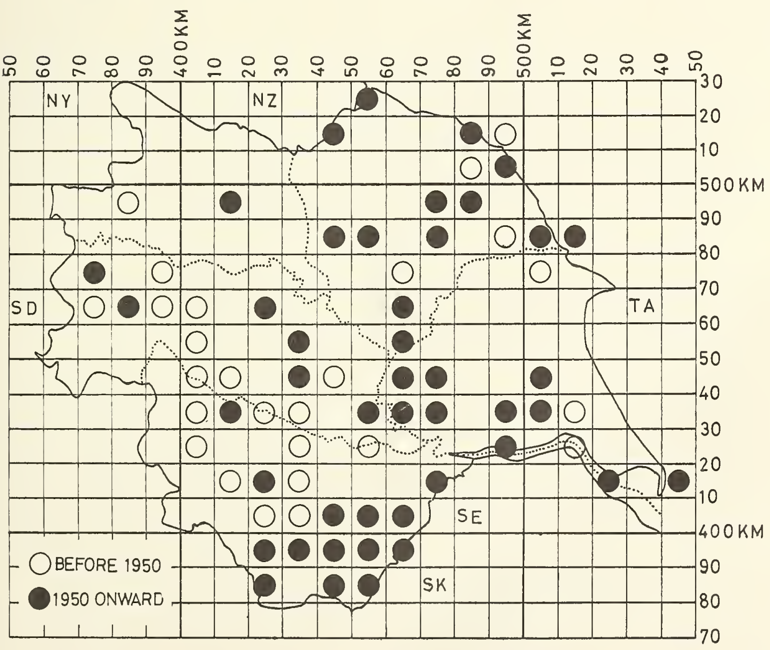
P. J. Hogarth

THE MASON WASPS (HYMENOPTERA: EUMENIDAE) OF YORKSHIRE

M. E. ARCHER

17 Elmfield Terrace, Malton Road, York YO3 0EH

The mason wasps are narrow-bodied insects, being coloured black with yellow stripes and spots. They are smaller than the more familiar social wasps. The adults emerge in May, or more usually in Yorkshire, in June. After mating the female searches for a nest site. Yorkshire species either excavate cells in the ground or use hollowed-out plant stems or old beetle borings in wood. After a cell is built an egg is laid attached to the upper wall from which it usually hangs by a short thread. The cell is then filled with a variable number of paralysed insect larvae, usually the caterpillars of the Lepidoptera but sometimes the larvae of Coleoptera. The cell is then sealed. Each nest of cells is built and provisioned by a single female although several females may nest close together in a favourable nesting area. On hatching from the egg, the larva eats the provided prey in one to two weeks and then usually enters a pre-pupal resting stage to pass the winter, pupation occurring some three weeks before the adults emerge. The pupal period of the female is longer than that of the male, so enabling the males to emerge first. The adults' main sources of food are the nectaries of flowers and the honeydew of aphids, although they probably take insect body fluid when malaxating the prey. The adults are particularly associated with the plant families Umbelliferae, Euphorbiaceae and Rosaceae. Fuller details of the biology of mason wasps are given by Spradbery (1973).



Map 1. Records received of mason wasps from Yorkshire to December 1980

The British mason wasps are represented by 22 species in 8 genera, of which 12 species in 3 genera have so far been found in Yorkshire. Keys for the identification of species are given by Spradbery (1973) and Richards (1980).

The study of the mason wasps in Yorkshire started with Smith (1852) who found four species near Wakefield: *Odynerus spinipes* (Linn.), *Ancistrocerus parietum* (Linn.), *A. scoticus* (Curtis), *Symmorphus gracilis* (Brullé). Smith (1858) added a fifth species *A. antilope* (Panzer), stating that this species 'is very abundant in Yorkshire'; the species is rare today. Roebuck (1877) repeated Smith's earlier work but after a gap of thirty years Roebuck (1907) extended the list with the addition of four species: *A. nigricornis* (Curtis), *A. oviventris* (Wesmael), *A. parietinus* (Linn.), *A. trifasciatus* (Müller) resulting from the collecting of Bayford at Barnsley, Carter at Shipley Glen, Thornley at Bawtry, and Wilson at Holgate, York (Table 1). Butterfield and Fordham (1930) added two more species: *S. crassicornis* (Panzer) and *S. mutinensis* (Baldini), and greatly extended the vice-county and locality records (Table 1 locality records converted to 10-km square records). This paper appears after a further gap of just over fifty years with the addition of one more species: *A. gazella* (Panzer), nearly doubling the vice-county and more than trebling the 10 km square records (Table 1).

My sources of paper records apart from the references already mentioned are: the longer and shorter Fordham card indices (kept at Doncaster and Keighley Museums respectively), the recorder for Yorkshire Hymenoptera (Mr J. H. Flint, 7 Norfolk Mount, Leeds LS7), Shaw (1953), Walsh and Rimington (1956) and Burns (1975). My sources of specimen records came from the following museums where the identity of the specimens have been checked or determined: Doncaster, Keighley, Leeds, Rotherham, Scarborough, Sheffield, York. Some of the specimens in these museums corresponded to the paper records so acting as a check on previous identifications. Mr Flint also kindly allowed me to examine some of his specimens. Further records are from specimens in my own collection.

TABLE 1

The number of 10-km grid squares and vice-counties in which each species of mason wasp has been recorded in Yorkshire

	Roebuck (1907)		Butterfield and Fordham (1930)		Present paper (1981)	
	V.C.s	grid squares	V.C.s	grid squares	V.C.s	grid squares
Odynerus spinipes	2	2	4	6	4	16
Ancistrocerus antilope	1	1	1	3	2	5
A. gazella	0	0	0	0	2	5
A. nigricornis	1	1	1	3	3	5
A. oviventris	1	1	3	6	5	20
A. parietinus	1	1	4	12	5	30
A. parietum	2	4	4	6	5	25
A. scoticus	1	1	3	8	4	23
A. trifasciatus	1	1	4	6	4	20
Symmorphus crassicornis	0	0	1	1	1	1
S. gracilis	1	1	2	2	4	4
S. mutinensis	0	0	1	2	3	11
Total	11	13	28	55	42	166

Records have been received from seventy 10-km grid squares of Yorkshire, twenty-six being previous to 1950 and forty-four with some records from 1950 onwards (Map 1). Table 2 indicates in which Yorkshire museum each species is held. I hope this paper will encourage a wider study of the mason wasps and that collectors will donate specimens to Yorkshire museums. I would be pleased to identify any specimens that are collected as a contribution towards this wider study.

TABLE 2

Yorkshire Museums holding examples of mason wasps found in Yorkshire (H = species held)

	Doncaster	Keighley	Leeds	Rotherham	Scarborough	Sheffield	York
Odynerus spinipes	H	H		H		H	
Ancistrocerus antilope		H					
A. gazella	H			H		H	
A. nigricornis		H					
A. oviventris	H	H			H		
A. parietinus	H	H	H	H	H	H	H
A. parietum		H	H	H	H	H	
A. scoticus	H	H					
A. trifasciatus	H	H	H	H			
Symmorphus crassicornis		H					
S. gracilis							
S. mutinensis		H			H	H	
No. of species	6	10	3	5	4	5	1

In the following comments on each species some are considered common. This statement is only meant in a relative sense as mason wasps do seem infrequent in Yorkshire: during twelve seasons I have taken only about sixty specimens, representing eight species, i.e. five specimens a year.

Odynerus spinipes (Linnaeus 1758) Map 2.

Not common but widely distributed and not yet recorded from V.C. 65. Builds cells in hard earth of vertical banks. Excavated soil used to form a chimney projecting horizontally from the burrow entrance but opening downwards. When the cells are provisioned the chimney is partially demolished and used to seal the burrow. The nest usually consists of five to six cells clustered together like a bunch of grapes. Flight period is from May to July, although it can be found to early August (Spradbery 1973). Most specimens have been collected in June.

Ancistrocerus antilope (Panzer 1798).

A rare species only found in two vice-counties, viz: V.C. 63 (SE04, SE11, SE32), V.C. 64 (SE33, SE35). Only one specimen has been found since 1950 (Harrogate June 1966, C. I. Rutherford, det. J. H. Flint). A tube dweller building a linear series of cells usually in bramble or elder but also in holes in wood and old mortar. The cells are separated by mud partitions. Flight period from May to June (Yarrow 1943, Spradbery 1973) but no information is available for the Yorkshire captures.

Ancistrocerus gazella (Panzer 1798) Map 3.

This species has only recently been recognized (Yarrow 1954) and separated from the very similar *A. parietum*. At present it is a rare species only having been recorded in V.C. 62 and V.C. 63. Although considered a southern species (Yarrow 1954), besides the Yorkshire records it has been recorded from SD62 (Blackburn, det. W. Kenneth-Booker), SJ38 (Liverpool, det. G. M. Spooner) and NZ41 (Preston, Egglescliffe, J. Warbrook, det. G. M. Spooner). It is a tube dweller with a flight period from June to September.

Ancistrocerus nigricornis (Curtis 1826) = *Odynerus callosus* Thompson.

This is a rare species, being found in V.C. 61 (TA07), V.C. 63 (SK69, SE04, SE13) and V.C. 64 (SD86). Only one specimen has been found since 1950 (Malham Tarn house, about 1955). It is a tube dweller with a flight period from March to September (Yarrow 1943, Spradbery 1973) although it has only been collected in June in Yorkshire.

Ancistrocerus oviventris (Wesmael 1836) Map 4.

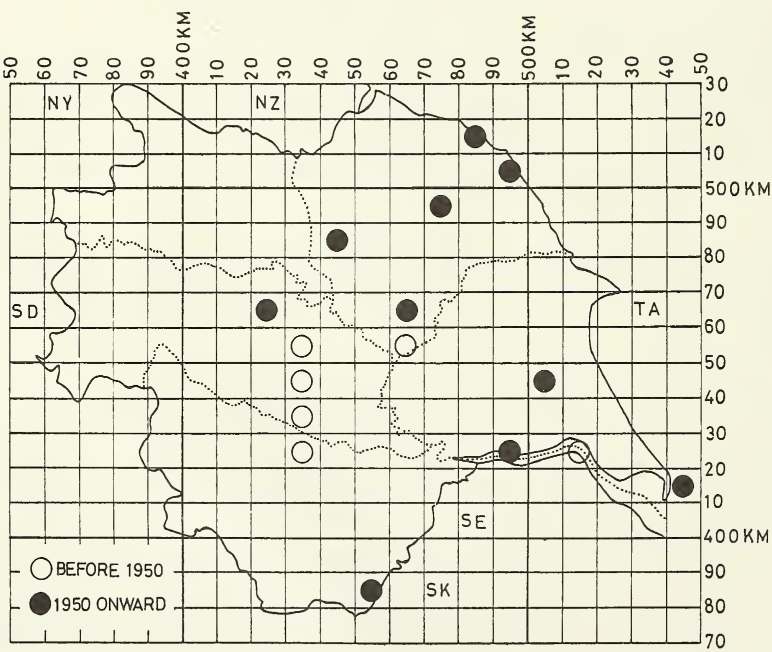
Common and widely distributed. This is our only mud-dauber species. Three to fourteen cells made of clay and water are built, usually in rows, in crevices. After the cells have been provisioned, clay is added to break up the outline of the cells. Flight period is from June to August with most specimens taken in June but Yarrow (1943) wrote it can be taken in May.

Ancistrocerus parietinus (Linnaeus 1761) Map 5.

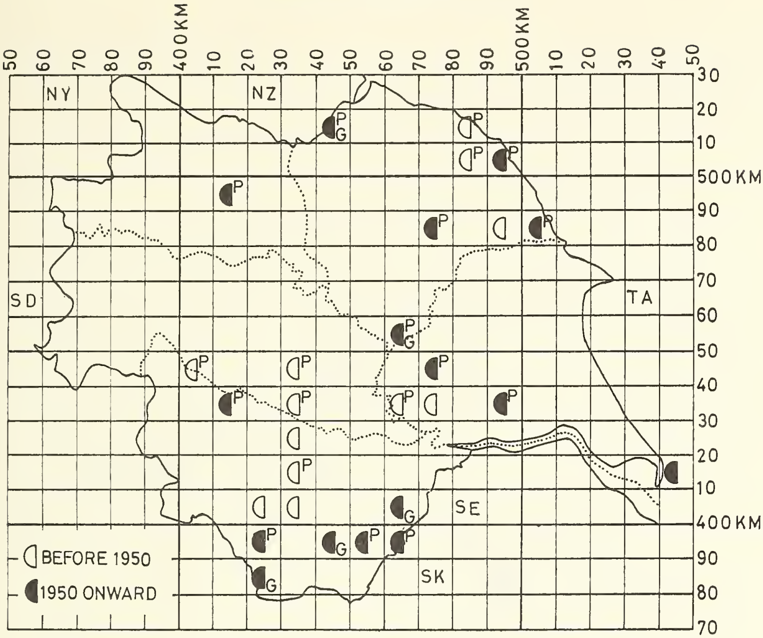
The most common species of mason wasp, being widely distributed. It is a tube dweller with a flight period from May to August with most specimens being taken in June and July, but it has also been taken in early October (Spradbery 1973).

Ancistrocerus parietum (Linnaeus 1758) Map 3.

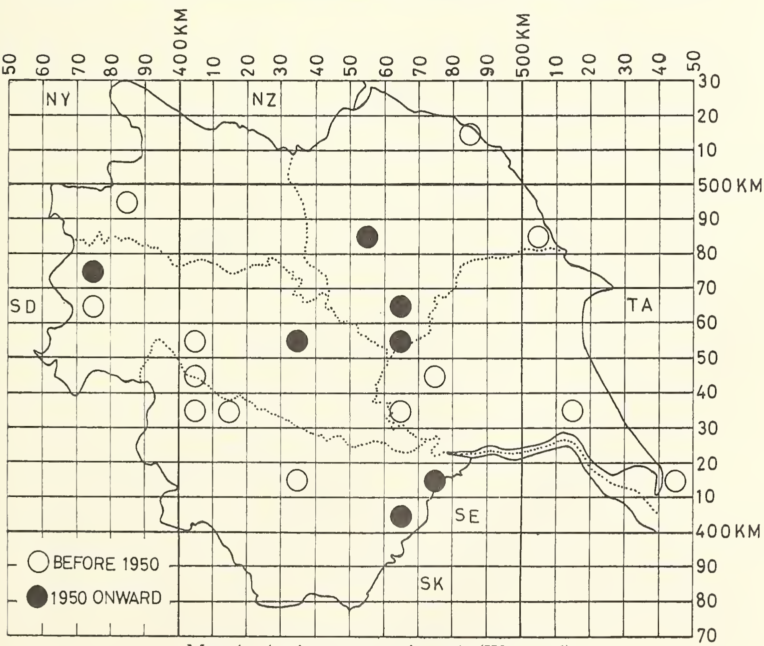
A common species widely distributed. As this species has been confused with *A. gazella* in the past, records of *A. parietum* and *A. gazella* are included on the same map. It is a tube dweller with a flight period from June to September, with most specimens taken from June to August. Yarrow (1943) and Spradbery (1973) note that it may be taken in May.



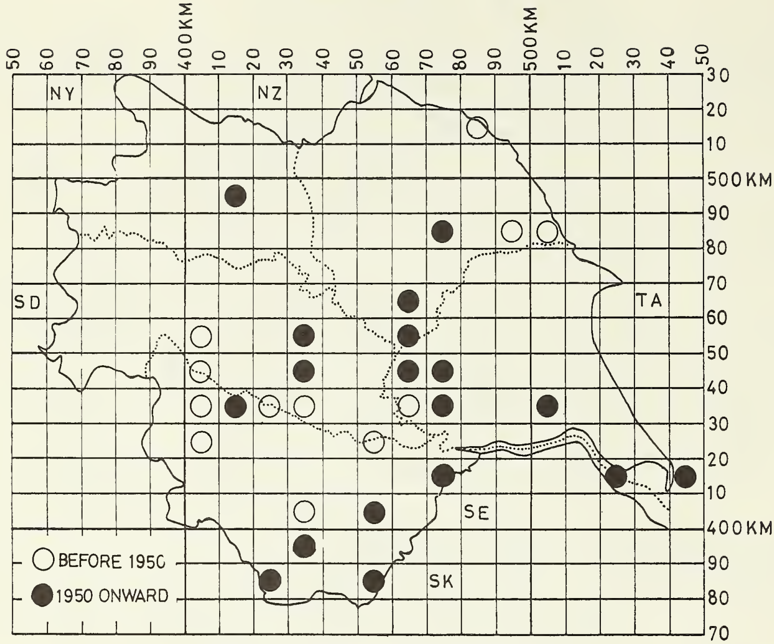
Map 2. *Odynerus spinipes* (Linn.)



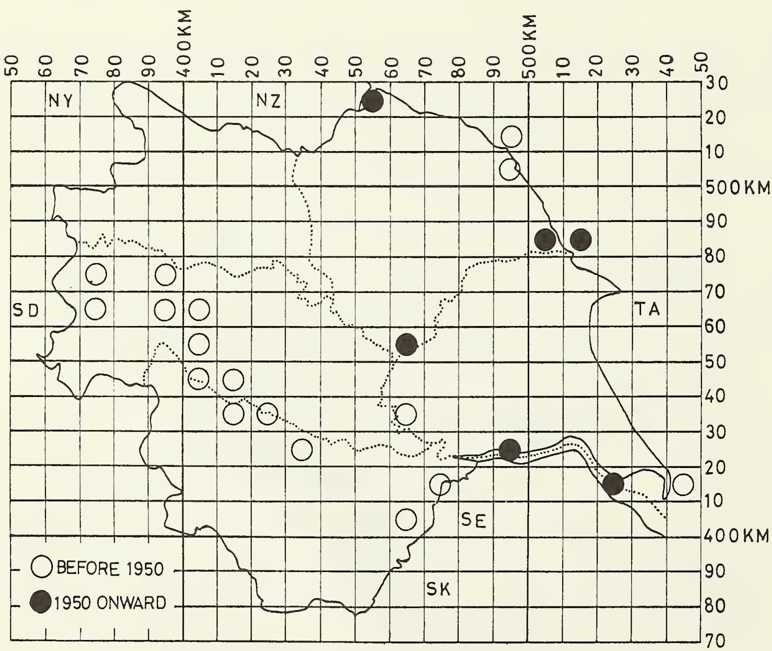
Map 3. *Ancistrocerus parietum* (Linn.) (= P) and *A. gazella* (Panzer) (=G)



Map 4. *Ancistrocerus oviventris* (Wesmael)



Map 5. *Ancistrocerus parietinus* (Linn.)



Map 6. *Ancistrocerus scoticus* (Curtis)

Ancistrocerus scoticus (Curtis 1826) Map 6.

A common species widely distributed although not yet found in V.C. 65. It excavates its cells in the ground with their openings flush with the surface. The cell walls are composed of a hard clay cement containing grains of sand and larger stones. When provisioned, each cell is sealed with a concave cap. Several cells may be built clumped together. The flight period is from May to September with most specimens being taken in June and July.

Ancistrocerus trifasciatus (Müller 1776) Map 7.

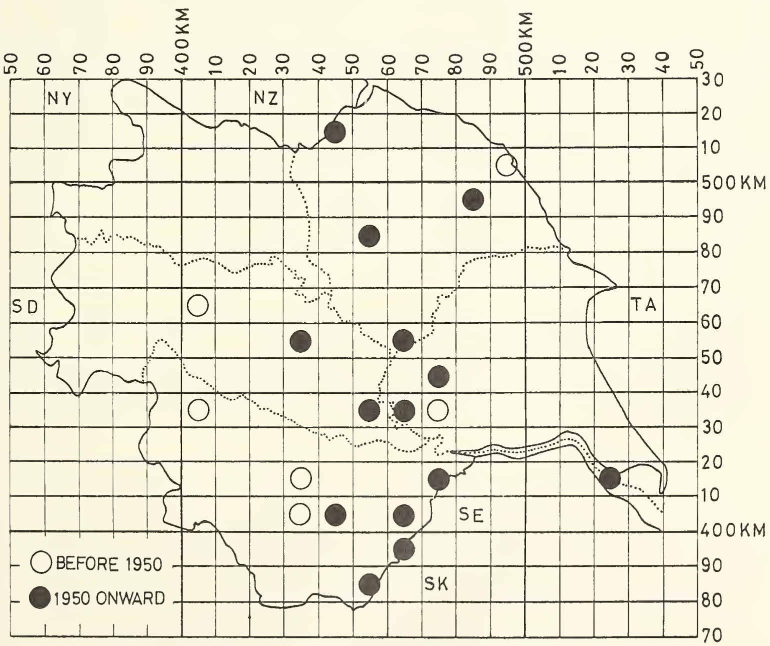
A common and widely distributed species although not yet found in V.C. 65. It is a tube dweller with a flight period from June to September with most specimens taken in June and July. Yarrow (1943) and Spradbery (1973) both give a flight period from May to early October.

Symmorphus crassicornis (Panzer 1798).

A very rare species which has only been collected in V.C. 61 (SE74, Allerthorpe Common) in the 1920s by W. J. Fordham. The Allerthorpe specimen was taken in July but Spradbery (1973) gives a flight period from June to August. Its nesting habits seem to be unknown. One of Fordham's Allerthorpe Common specimens is in the Cardiff museum (Guichard 1972).

Symmorphus gracilis (Brullé 1832) = *Odynerus elegans* Wesmael.

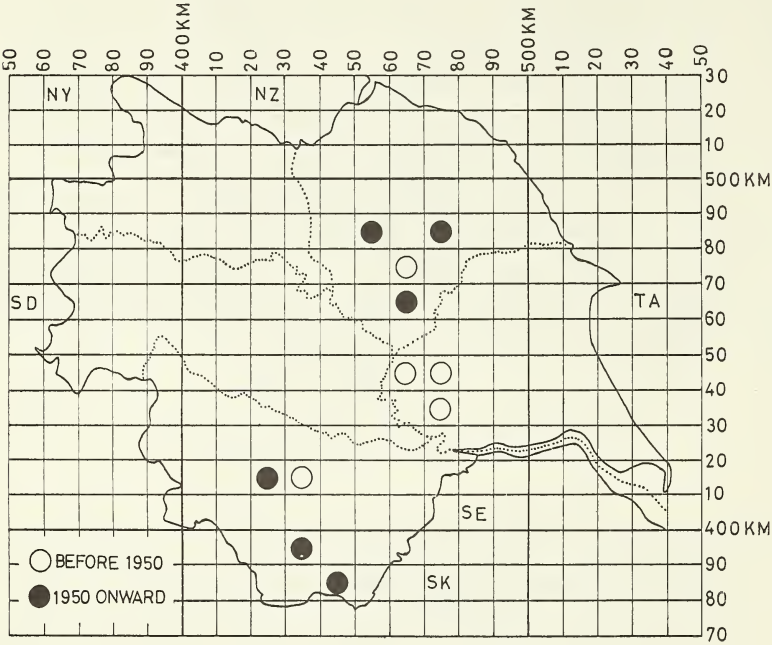
A rare species only taken at four localities in Yorkshire, viz: V.C. 61 (SE74, Allerthorpe Common) in the 1920s by W. J. Fordham and R. Butterfield and in June 1945 by W. D. Hincks; V.C. 67 (SE67, Hovingham) by R. Butterfield in 1935; V.C. 63 (SE32, near Wakefield) by F. Smith in July 1852; V.C. 64 (SE44, Stutton) by J. H. Flint in July 1947. No specimens of this species are present in the museums of Yorkshire but I have seen J. H. Flint's specimen and confirmed its identity. It is a tube dweller and Spradbery (1973) gives a flight period during June and July which coincides with the Yorkshire records.



Map 7. *Ancistrocerus trifasciatus* (Müller)

Symmorphus mutinensis (Baldini 1894) = *S. sinuatissimus* Richards = *Odynerus sinuatus* (Fabricius) Map 8.

Not common but recorded in V.C. 61, V.C. 62 and V.C. 63. It is a tube dweller, having a flight period from May to August, with most specimens collected in July. Spradbery (1973) gives a flight period extending to September.



Map 8. *Symmorphus mutinensis* (Baldini)

ACKNOWLEDGEMENTS

I am indebted to the following staff of other institutions who arranged access to museum collections: W. A. Ely (Rotherham), M. M. Hartley (Keighley), C. I. Massey (Scarborough), A. Norris (Leeds), T. H. Riley (Sheffield), P. Skidmore (Doncaster), C. G. Simms (York). I would also like to thank J. H. Flint for help and advice during several pleasant evenings spent together examining specimens.

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A SPECIES OF *TRIPHLEBA* RONDANI (DIPTERA, PHORIDAE) FROM WEARDALE, NEW TO BRITAIN

R. H. L. DISNEY

Malham Tarn Field Centre, Settle, North Yorkshire

While preparing a Key to the British species of *Triphleba* I have discovered that of a male and female specimen collected from Grass Common, Weardale (Grid ref NY 825357) on 15 September 1978 (but supplementary to the collections described by Disney *et al*, 1981) and attributed to the species *Triphleba gracilis* (Wood), the identification of the female is incorrect. This proves to be *Triphleba crassinervis* (Strobl, 1910), a species previously known from Austria, West Germany and Holland.

In Schmitz's (1943) Keys to Palaearctic *Triphleba* species, the Weardale specimen keys to *T. gracilis* at couplet 16. However Schmitz's couplet 13 is most unsatisfactory in that it uses the extent of the development of the anal vein (vein 7) to separate specimens, and yet this vein is frequently so obscure as to be scarcely discernible. Schmitz in part allows for this being so by keying *T. gracilis* both ways. He does not do the same for *T. crassinervis*. In the Weardale specimen the anal vein is almost invisible in the distal third.

Although *T. crassinervis* and *T. gracilis* are closely related they can be readily separated by the following characters:

Fore coxae yellow. Wing membrane brownish. Veins 4–6 dark and easily seen with a ×10 hand lens .... *gracilis*
— Fore coxae brown. Wing membrane greyish. Veins 4–6 pale and scarcely discernible with a ×10 hand lens .... *crassinervis*

Acknowledgements

I am grateful for grants from the Royal Society to aid my studies of Phoridae.

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BOOK REVIEWS

Volcanoes: A Primer by **R. Decker** and **B. Decker**. Pp. ix + 244, including 122 b/w photographs and illustrations. W. H. Freeman. 1981. Board £9.95, paperback £4.50.

Despite being written in a popular style and described as a primer this is an authoritative, interesting and up-to-date book. It clearly relates different types of volcanoes to plate technics and outlines the concept of magnetic differentiation. Aspects of general interest such as the relationship between volcanoes and mineral deposits and the effect of eruptions on global climate are competently covered. There are graphic accounts of the formation of Surtsey, the eruption of Krakatau, and other volcanic events, enlivened by striking photographs and well chosen maps and diagrams. The text is easy to read and contains such a wealth of information that it may well broaden the knowledge of experienced geologists as well as adequately informing the layman about the awesome powers associated with volcanoes.

DEC

London Walks by **Guy Williams**. Pp. 283, with photographs and maps. Constable. 1981. £5.50.

This is a genuinely pocket-sized book full of interesting information set out in the form of twenty walks in different parts of the metropolis. It should prove invaluable to people who would like to explore London on foot. There is nothing about natural history however, even in the walks across Hampstead Heath, to Kew, and round various parks. This is no doubt because the subject has already been dealt with in the author's *The Royal Parks of London* issued by the same publisher in 1978.

FHB

The Weald by **Wes Gibbons**. Pp. viii + 116, including many line drawings, maps and photographs. Allen and Unwin. 1981. £3.95.

Snowdonia by **M. F. Howells, B. E. Leveridge** and **A. J. Reedman**. Pp. viii + 119, including many line drawings, maps and photographs. Allen and Unwin. 1981. £3.95.

Both of these volumes have been written by professional geologists, have broadly the same format and are practically bound in 'field work resistant' plasticized covers. The first half of each work deals with the major types of geological formation in the area, emphasizing their genesis and character, whilst in the latter part there are detailed itineraries for geological walks. The volume on Snowdonia has fourteen itineraries whilst the Weald has eleven.

In both volumes the walks are clearly outlined, with details of car parking, access, useful maps, indications of the time required to complete the excursion and a generous use of six- and eight-figure grid referenced locations to help ensure that the itinerary can be followed. In addition there are helpful detailed maps of the geology associated with most of the excursions, on which the route and points of interest are marked, and occasionally annotated photographs and diagrams.

The two volumes differ considerably in their approach and appeal. The Weald is written in a semi-popular style, and relates geology to land use, historic mineral working, local building stones and other points of general interest. With its broad 'geology and countryside' base it may well prove attractive to a wide spectrum of geographers and natural historians.

The volume on Snowdonia is at a more narrowly specialized geological level and uses many more technical terms to describe the character of the volcanic and other rocks in the area. The photographs are particularly well chosen and there are some clear and very informative diagrams which help to explain many of the technical terms. It will probably be of most interest to serious students of geology.

Both books define most of the technical terms that are used and have useful glossaries and a fairly comprehensive index, which should help the lay reader to find the meaning of specialized terms. The authors have, where possible, used working quarries and areas of rapid erosion as sites for examination, presumably to help reduce the dangers of permanent site despoilation. They also provide the addresses of the landowners from whom permission to visit sites should be sought. The books are likely to be of most use to enthusiastic amateur geologists, geology students, and teachers of geology and physical geography.

DEC

THE FRAGMENTATION OF SMALL MAMMAL SKELETONS FROM THE PELLETS OF ADULT LITTLE OWLS

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Introduction

During the course of a wider study of the diet of the Little Owl *Athene noctua*, it was discovered that the skeletons of small mammals found in the pellets were often incomplete. Thirty-six pellets containing small mammal remains were analysed in order to establish the degree of skeletal fragmentation. Of 100 pellets collected between 25 September 1978 and 25 February 1979 at Lancaster, twenty-four contained the remains of small mammals. These and a further twelve collected by Jim Glover in the Forest of Bowland, Lancashire, are considered here.

Methods

The pellets were soaked in warm water for about three-quarters of an hour before being dissected. The matrix was teased open, using dissecting needles, and all long bones, skull parts and pelves were removed, along with any other items which were discovered within an allotted time of about forty minutes per pellet. The bones were then bleached and identified using standard works and a reference collection.

Results

Not all the bones could be ascribed to individual animals or even specifically identified, so the pellet contents are expressed through three tables. There were four species involved: *Apodemus sylvaticus, Microtus agrestis, Sorex araneus*, and *S. minutus*. Table 1 shows the frequency with which the various combinations of bones occurred for all species. These combinations are in turn summarized for each of the three genera and are presented alongside genus in Table 2. Table 3 shows the frequency of occurrence of selected bone types. In the results skulls may be represented by crania, mandibles or both; limbs by one or more of the long bones therein; the posterior half of an animal by at least its hindlimbs and os coxae and the anterior half by at least its two forelimbs.

Of the fifty or more animals ingested only ten were represented by all the major bones of the skeleton, with a further three represented by all but one major bone. (Such cases are summarized as whole skelteons in Table 2 but are not treated as such in Table 1.) However, the skulls of forty-one (82 per cent) of the animals were found. This compares with an average

TABLE 1

Frequency of occurrence of small mammal bone combinations in Little Owl pellets

	1 forelimb	1 hindlimb	2 hindlimbs	anterior half	whole skel.	traces only	nothing else
Skull	–	1	0	0	–	–	6
1 forelimb	–	0	1	–	–	–	0
posterior half	0	–	–	3	–	–	0
skull/1 forelimb	–	3	1	–	–	–	4
skull/posterior half	2	–	–	–	–	–	3
nothing else	–	0	1	0	10	4	–

maximum recovery rate of only 31 per cent for limb bones and 42 per cent for os coxae. There were no obvious differences between species in any of the points under consideration.

There was a tendency for pellets which contained mere traces of mammal remains to contain a large quantity of insect material, and for those containing large numbers of mammal bones to contain less insect material.

TABLE 2

Frequency of occurrence of skeletal components in Little Owl pellets

	traces only	posterior ½	skull only	1 or 2 limbs	3 or 4 limbs	skull/1 limb	skull/2 limbs	skull/post. ½	decap. skel.	whole skel.	total
Microtus	4	0	2	1	1	3	2	0	2	4	19
Apodemus	0	0	2	0	0	0	1	0	0	5	8
Sorex spp.	2	1	2	0	0	3	1	3	1	4	17

TABLE 3

Total number of major bone types in Little Owl pellet collection

No. of animals	at least 50
Skulls	41
Humeri	28
Ulnae	23
Femuri	30
Tibiae	42
Os coxae	30

Discussion

Firstly, it must be said that the fragmentation of animals' skeletons in pellets does not by itself indicate that they were partially eaten. Given that care was taken to use whole pellets only, two additional possibilities can be considered, namely that some bones are wholly digested and do not appear in the pellets and that some indigestible material is retained in the gut for longer than the period over which pellets are produced.

It would appear from these results that the incompleteness of the skeletal record in individual pellets cannot be explained by the retention of bones in the gut, although Chitty (1938) has shown that this does occur. In the event of retention, a rough balance between the numbers of the various parts of the skeleton would be expected when bones from a large number of pellets are combined, even if they were obtained over a long period and from different birds. Partial digestion can be ruled out in view of the condition of the remaining bones and the results obtained by earlier workers. Partial ingestion can cause problems for workers analysing raptor pellets (Yalden, 1980), although it is generally assumed that owls are ill-equipped for picking at or dismembering prey.

The number of individual animals represented in a collection of Little Owl pellets can not be obtained by a count of one particular bone type; the best minimum is obtained from a closer examination, using measurements, dates, sex and limb parity to eliminate the possibility that, for example, two bones had come from the same animal. Small mammals are not eaten whole, this

being recorded in only twenty to forty per cent of cases. Skulls are ingested more often than other parts; up to two and a half times as often as any given limb. It seems that partial ingestion is associated with a high incidence of insects in the meal. Perhaps the Little Owl has difficulty dealing with a whole animal late in the hunting period if it has already fed up on beetles.

ACKNOWLEDGEMENT

I am grateful to Jim Glover for helping me to obtain pellets for analysis.

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FIELD NOTE

Northern limits of three Orthoptera

From 1974 to 1980 a survey of the Orthoptera associated with the North Bank of the River Humber has been carried out. This note concerns itself with three species, namely *Conocephalus dorsalis* (Latreille), *Metrioptera roeselii* (Hagenbach) and *Chorthippus albomarginatus* (Degeer). The two species of bush-cricket are at their recorded northern limit at this point (Haes, E.C.M., ed. 1979. *Provisional Atlas of the Insects of the British Isles*. Part 6, Orthoptera. Institute of Terrestrial Ecology, Huntingdon). Apart from two pre-1961 records, on the west coast and in Northern Ireland, this is also the recorded northern limit of *C. albomarginatus*.

The B.R.C. distribution maps indicate that *C. dorsalis* occurs in three 10-km squares. We have found this species in two main areas. The densest population was found along the banks of Fisherman's Creek, four kilometres south of Patrington. The second population was found along Long Bank Dyke, Kilnsea and has been previously noted by W. D. Hincks (*Journ. Soc. Brit. Ent.* **3**:157–8 (1950); *Naturalist* 1949:31) and E. C. M. Haes (*Naturalist* 1975:28). We have also found a single male two-thirds of the way south along Spurn Point (TA/412123). It seems likely that this individual was transported from the Kilnsea site. In total this species has been recorded by us from only four 1-km grid squares.

M. roeselii has been noted in the Kilnsea area by W. D. Hincks (*Journ. Soc. Brit. Ent.* **3**:157–158 (1950); *Naturalist* 1949:31), E. C. M. Haes (*Naturalist* 1975:28) and M. Limbert (*Naturalist* 1975:156). We located four places, separated by about 0.5 kilometres, where this species occurs. In the areas in which it has previously been noted, namely Beacon Lane (Kilnsea) and Long Bank Dyke, it was still present in 1980. Further populations have been found by us at the sides of dykes (TA/411157 and TA/390180). The densest population of this species was found at the northern end of Long Bank Dyke, where during the summer of 1980 the song of the males was a major feature of that area. In all *M. roeselii* was recorded from a total of nine 1-km grid squares, in each case associated with a drainage channel.

As mentioned above North Humberside is also the limit on the east coast for *C. albomarginatus*. We have looked in detail at most of the area between Spurn and Paull and have found this species in almost every 1-km square, along the Humber shore. West of Hull this species has been found at Faxfleet and Saltmarshe, though this area still requires closer scrutiny.

The habitat requirements of the two bush-crickets seem fairly clear, but the limitations on *C. albomarginatus* are not quite so clear and require further study. For this it would be useful to have further records and any specimens of Orthoptera from North Humberside would be gratefully received by the authors at the address below. A closer examination of suitable localities further north, such as the mouth of the River Tees might well prove fruitful.

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NOTES ON YORKSHIRE MOLLUSCA — 4

Succinea (Succinella) oblonga Draparnaud 1801 *at Queen Mary's Dubb, Ripon*

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Whilst surveying the molluscan fauna of Ripon Parks with several members of the Yorkshire Conchological Society, we obtained a number of specimens of a small species of *Succinea* in marshes bordering the large pond in Queen Mary's Dubb, Ripon (VC 64), SE44/303752. The largest specimens were subsequently dissected by Dr. L. Lloyd-Evans and found to be *Succinea (Succinella) oblonga* Draparnaud 1801.

The discovery of *S. oblonga* in Ripon Parks is important in that this is the first colony to have been located within the county. Only one other living specimen has been recorded from Yorkshire in this century. Dr Brian Coles found a single semi-adult specimen on Asselby Island on the River Ouse in April 1977. (Norris, A., 1978). This record was not placed in any specific vice-county at the time, due to its location astride the vice-county boundary. The national recorder for The Conchological Society of Great Britain and Ireland, however, has subsequently placed the record officially in VC 64, Yorkshire mid-west. Asselby Island is in such a position, however, that it could just as easily have been designated as a record for VC 61, Yorkshire south-east. The site at Queen Mary's Dubb is in a similar position, being very close to the northern boundary of the vice-county. There is no doubt, however, that this locality is within VC 64, and should, therefore, be considered as the first site from within that vice-county. Queen Mary's Dubb is situated on the south-western bank of the River Ure about two kilometres north of Ripon, and is part of the area known as Ripon Parks. The habitats in which the specimens were found are marshes resulting from the infill of the ponds by vegetation. Over half of the pond at one of the sites is now composed of a thick mat of *Iris pseudacorus* L., *Juncus, Carex,* etc.

In general, the marsh is fairly rich in molluscan species including the rather local *Vertigo (Vertigo) antivertigo* (Draparnaud 1801). The *S. oblonga* were located at the edges of these marshes on bare mud. The dominant vegetation in these areas is *Juncus inflexus, J. effusus, Ranunculus repens, Lychnis flos-cuculi, Rumex acetosa, Cardamine pratensis,* and *Cirsium palustre.* Associated mollusca were *Carychium minimum* Muller 1774, *Deroceras (Deroceras) laeve* (Muller 1774), *Euconulus (Euconulus) alderi* (Gray 1840) and *Lymnaea (Galba) truncatula* (Muller 1774).

Acknowledgements

I would like to thank Mr A. P. Taylor of Middle Parks Farm for kindly giving us permission to go over the area, and Dr L. Lloyd-Evans for confirming the identification of the specimens.

Reference

Norris, A. (1978) Notes on the occurrence of *Succinea (Succinella) oblonga* Draparnaud 1801 in Yorkshire. *Naturalist* **103**:29–30.

BOOK REVIEW

The Archives of the Peat Bogs by **Sir Harry Godwin**. Pp viii + 229, including 72 b/w plates and 76 figures. Cambridge University Press. 1981. £25.

A further contribution from the scholarly pen of Britain's foremost archaeological botanist. This work does not possess the definitive quality of his monumental *History of the British Flora* nor the impact of his more recent *Fenland: Its Ancient Past and Uncertain Future* (see *Naturalist* **103**:125), but it does enable us to explore in an informal manner the scientific investigation of peat bogs, and to share in the excitement of the many archaeological and botanical discoveries therein. Much of the work is centred upon the Somerset Levels, from which it has been possible to derive evidence of land- and sea-level movements, and to determine past vegetation and the impact of man on the landscape. This attractive and authoritative account is highly recommended to a wide readership.

PRELIMINARY OBSERVATIONS ON THE FISH FAUNA OF THE ESTUARY OF THE RIVER BLYTH, NORTHUMBERLAND

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ABSTRACT

The occurrence of fish in the estuary of the River Blyth, Northumberland, has been monitored by collecting specimens from the intake screens of the Central Electricity Generating Board Power Station at Blyth. Regular visits from September 1979 to December 1980 resulted in a list of 49 species. A complete list of the species found is accompanied by notes on their status and seasonal distribution.

INTRODUCTION

Blyth Power Station is situated on the estuary of the River Blyth, Northumberland (Fig. 1.) and abstracts some 700,000 gallons of cooling-water per minute. Water is passed through coarse grids into screenwells, where rotating drum-screens of fine metal mesh remove weed, invertebrates and fish. The fine screens are washed by water sprays, the organisms removed passing along a channel and into a collecting pit, which is periodically cleared by power station staff. The animals collected in this way include molluscs, crustaceans, and coelenterates (particularly Scyphozoa during the summer months), but by far the most important catch in terms of

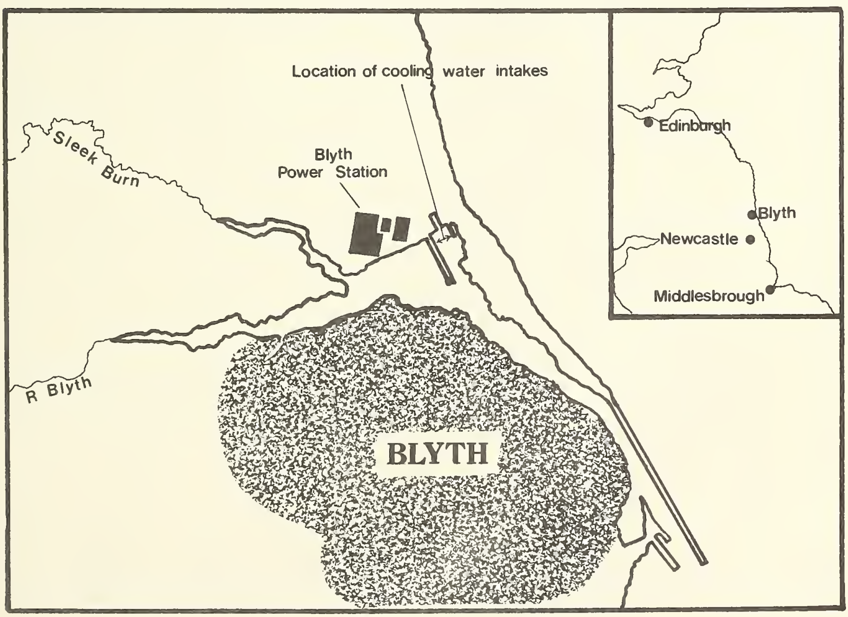
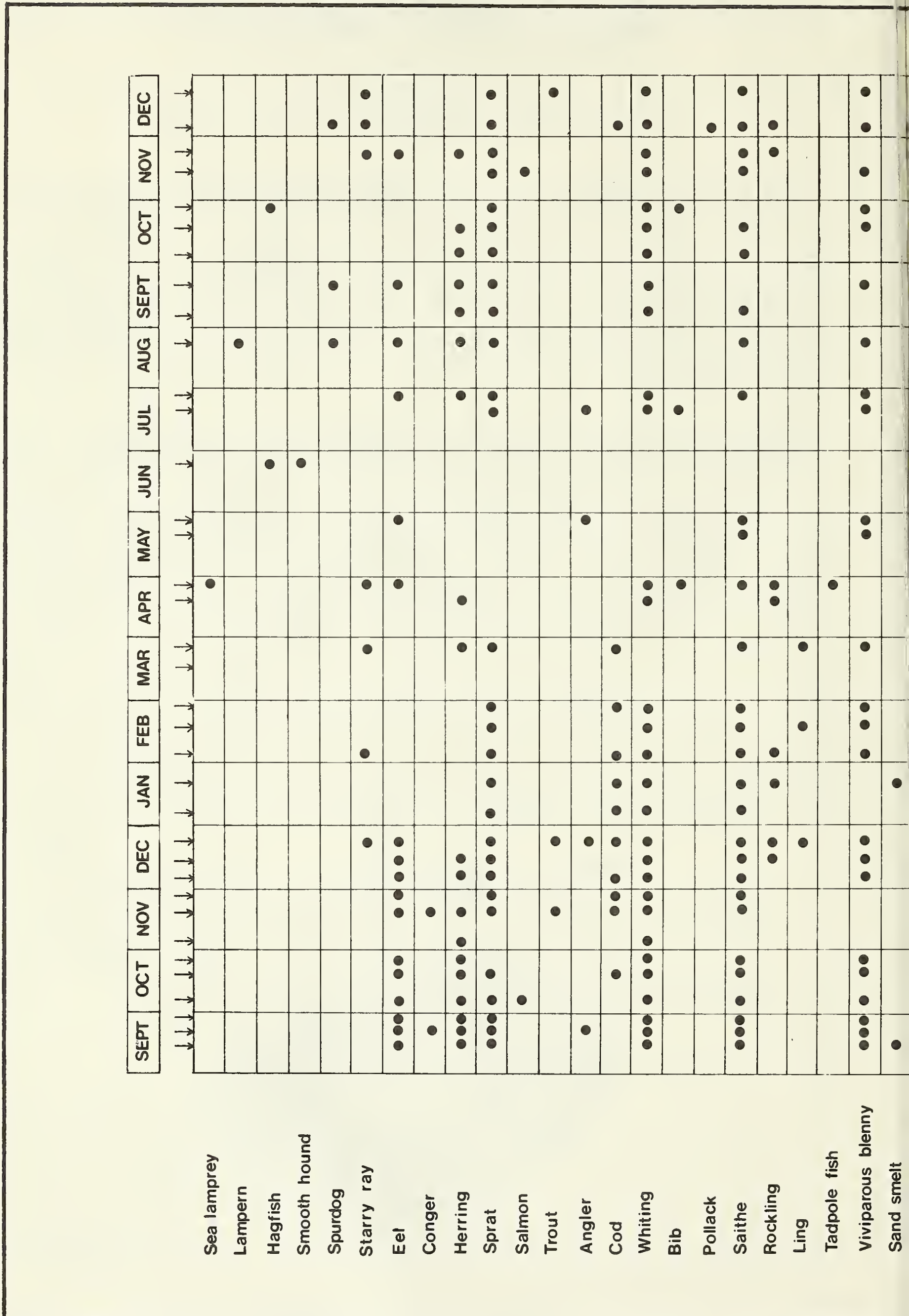


FIGURE 1
The estuary of the River Blyth.


SEPT
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Sea lamprey
Lampern
Hagfish
Smooth hound
Spurdog
Starry ray
Eel
Conger
Herring
Sprat
Salmon
Trout
Angler
Cod
Whiting
Bib
Pollack
Saithe
Rockling
Ling
Tadpole fish
Viviparous blenny
Sand smelt

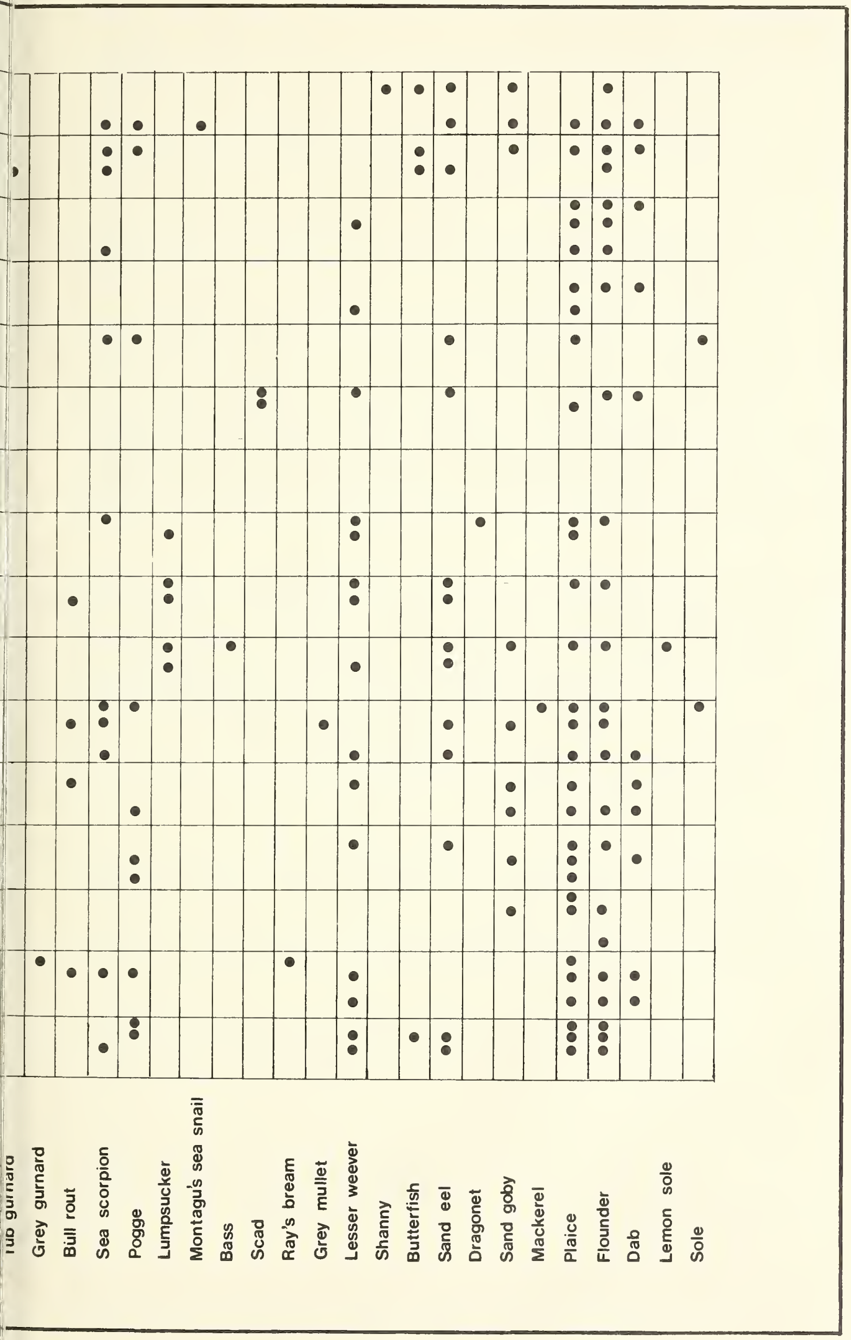

FIGURE 2
Fish records from the intake screens of Blyth Power Station, September 1979 — December 1980.

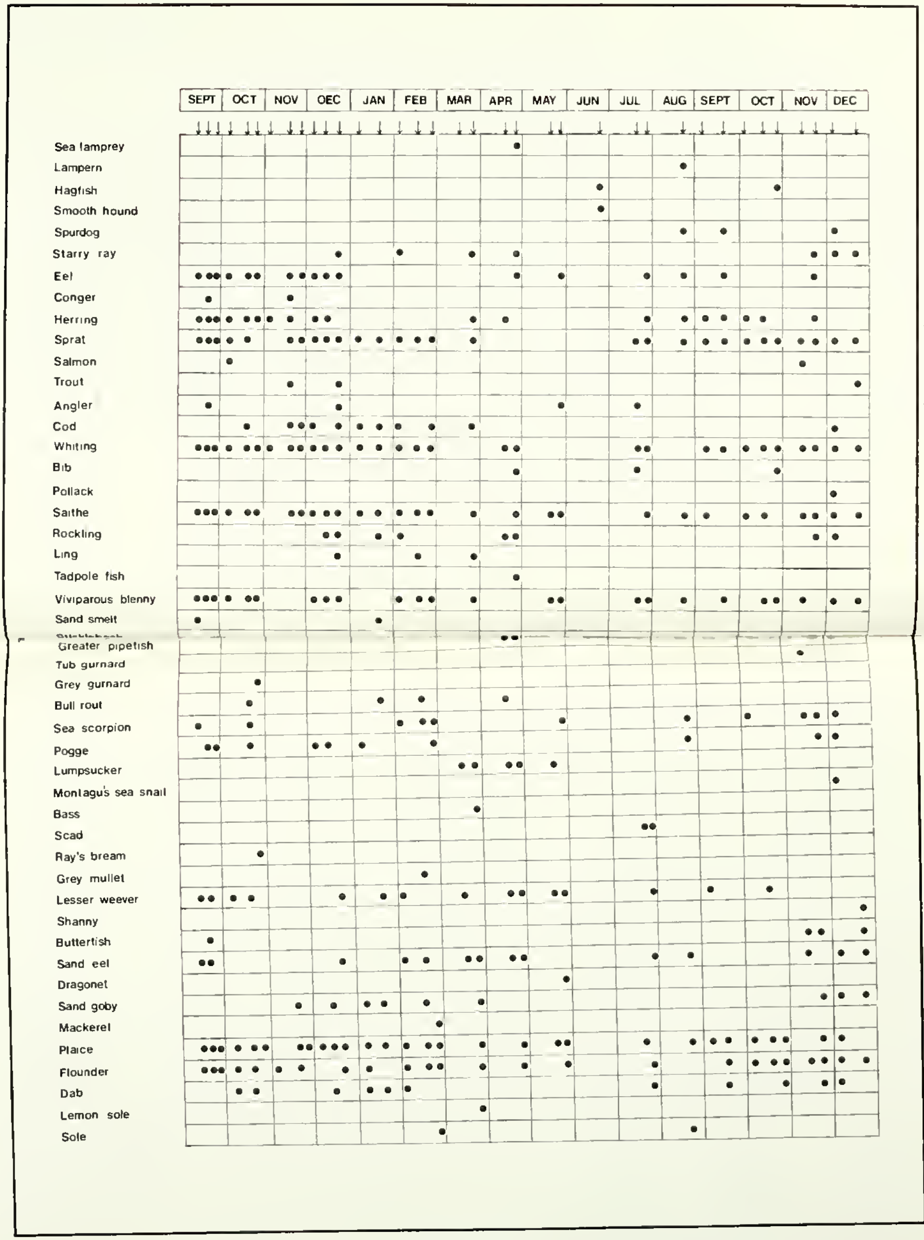

FIGURE 2
Fish records from the intake screens of Blyth Power Station, September 1979 — December 1980.

abundance and species diversity is the fish. At certain times of the year, with the correct combination of wind and tide, vast numbers of fish are filtered from the intake water.

The phenomenon of large numbers of fish impinging on power station filters is well documented. For example Holmes (1975) reported weekly catches of up to 60,000 small fish on the intake screens at Fawley Power Station in January 1974. The influx of large numbers of fish can lead to operational difficulties and even temporary closure, as described for Dungeness Power Station by Langford (1977). The effect of the continuous removal of a proportion of the fish population in the vicinity of power stations has been examined by the C.E.G.B.'s Marine Laboratory Staff and others, and their quantitative observations suggest that although at times large numbers may be impinged, these are small in terms of total population size. (Langford, pers. comm.) However, smaller fish are generally more vulnerable to impingement (Langford *et al*, 1977) and where the bulk of egg production lies with smaller (1+ group) fish, local populations may be sensitive to impingement mortalities (Turnpenny *et al*, 1981).

Although aware of the physical problems occasionally created by fish capture and subsequent ecological considerations, this particular study had very limited goals. The aim was to visit Blyth Power Station as frequently as possible in order to investigate the present status and seasonal distribution of fish occurring in the estuary and also, to increase the fish collections of the Sunderland and Hancock Museums. An approach was made to the C.E.G.B. to permit us to monitor the catch; this was greeted with enthusiasm, not only by the management, but also by the pump-house staff. The co-operation of the latter has been a significant factor in the success of the monitoring process. With permission to enter the site and examine the collecting pits, the project began in September 1979.

Methods

Thirty-seven visits were made to the power station at no longer than fortnightly intervals. During a visit, a list of the species present in the collecting pit was made, and any specimen not immediately recognizeable taken back to the laboratory for identification. As a supplement to this procedure, a large plastic dustbin containing liquid preservative was left on-site, into which any unusual specimens were deposited by the pump-house staff. The specimens collected in this way were considered as part of the fish fauna listed on the day of the visit.

Reference collections of fish have been made by the authors and stored at Sunderland Museum and the Hancock Museum, Newcastle upon Tyne.

Results and Discussion

The occurrence of the fish species throughout the survey period is presented in Fig 2. The 'percentage occurrence' for a species is the number of times it was recorded from a possible total of 37, expressed as a percentage figure.

In the following notes on the species the data are compared with information on the distribution of fish given by Wheeler (1969 and 1978). Species nomenclature and order follow that of Wheeler (1978).

Sea lamprey. *Petromyzon marinus* Linnaeus, 1758
Recorded only once (2.7%) in April 1980. This species breeds in freshwater in May and June, and this animal may well have been ascending the River Blyth searching for a suitable breeding site.

Lampern. *Lampetra fluviatilis* Linnaeus, 1758
A migratory lamprey which ascends rivers from the sea from August to November, and recorded only once (2.7%) in the estuary in August 1980. Although lamperns live in inshore waters and estuaries, it would seem from the single occurrence that the Blyth estuary probably does not support a resident population.

Hagfish. *Myxine glutinosa* Linnaeus, 1758
Recorded on 2 (5.4%) occasions only. Although the Northumberland and Berwickshire coasts have well documented local populations (Wheeler 1969), it is a species which does not normally tolerate low salinity. Its presence in the Blyth estuary is therefore considered rather unusual.

Starry smooth hound. *Mustelus asterias* Cloquet, 1819
A single specimen (2.7%) recorded in June 1980. It is regarded as a rather uncommon shark in Northern European waters and its occurrence in the Blyth estuary is therefore of considerable interest.

Spurdog. *Squalus acanthias* Linnaeus, 1758
Recorded on 3 (8.1%) occasions from the estuary at the latter part of the year. The majority of specimens are small, possibly first-year individuals.

Starry ray. *Raja radiata* Donovan, 1806
Perhaps one of the most interesting species to occur in the estuary, as it is regarded as being at the southern limit of its range in British waters, and rarely found close inshore. Recorded on 7 (18.9%) occasions this species seems to be a visitor in the winter (December–April) months.

Eel. *Anguilla anguilla* Linnaeus, 1758
A common species in the estuary of the River Blyth, found throughout the year, suggesting a resident estuarine population. Recorded 17 (45.9%) times.

Conger eel. *Conger conger* Linnaeus, 1758
Although no examples of this species have been seen by the authors, reports of very large eels have been received on 2 (5.4%) occasions. It is unlikely that this species is a resident member of the estuarine fish fauna, but instead an irregular visitor, possibly as a result of prevailing tides and weather conditions.

Herring. *Clupea harengus* Linnaeus, 1758
One of the most common species in the estuary, having been recorded on 20 (54%) visits. The pattern of seasonal distribution indicates a movement inshore during the winter months.

Sprat. *Sprattus sprattus* Linnaeus, 1758
A very common species, recorded on 28 (75.6%) visits to the site. Often present in vast numbers during the winter months, when the sprat shoals move inshore.

Salmon. *Salmo salar* Linnaeus, 1758
The presence of the salmon in the polluted waters of the River Blyth is quite remarkable. Although only recorded on 2 (5.4%) occasions, it is likely to be under-recorded because of its highly prized gastronomic qualities. Interestingly, both records were in autumn, when migration to the freshwater spawning grounds would be expected.

Trout. *Salmo trutta* Linnaeus, 1758
Migratory trout have been recorded from the estuary on 3 (8.1%) occasions, and the remarks pertaining to salmon apply equally to this species.

Angler. *Lophius piscatorius* Linneaus, 1758
Although often regarded as a deep water fish, the Angler is relatively common in the North Sea below 10 fathoms. It has been recorded 4 (10.8%) times in the estuary, both in winter and summer, and must be regarded as an irregular visitor.

Cod. *Gadus morhua* Linnaeus, 1758
The cod shows a very characteristic inshore movement during the autumn and winter months. Recorded on 11 (29.7%) visits.

Whiting. *Merlangius merlangus* Linnaeus, 1758
The most common member of the Cod family to be found in the estuary, recorded on 30 (81.0%) occasions. It is present throughout the year, but appears in considerable numbers during the winter months, which is consistent with the expected inshore movement for the species.

Bib. *Trisopterus luscus* Linnaeus, 1758
A very common fish further offshore, this species was unexpectedly rare in the intake captures, being recorded on only 3 (8.1%) occasions.

Pollack. *Pollachius pollachius* Linnaeus, 1758
A rare species in the estuary, only one specimen having been recorded during the survey period. This single (2.7%) occurrence is consistent with the general status of the species on the north-east coast, where it is rarely recorded.

Saithe. *Pollachius virens* Linnaeus, 1758
In contrast to the pollack the saithe is one of the most abundant fish in the estuary, having been recorded on 29 (78.3%) visits, often in vast numbers.

Five-bearded rockling. *Ciliata mustela* Linnaeus, 1758
This common fish of the intertidal zone is a resident member of the estuary fish fauna, and has possibly been under-recorded because of its small size and undistinguished appearance. Recorded on 8 (21.6%) visits.

Ling. *Molva molva* Linneaus, 1758
Ling is a common species on rough ground off the north-east coast. It is essentially a deep water fish and its presence in the estuary on 3 (8.1%) occasions during winter months, is probably due to stormy weather.

Tadpole fish. *Raniceps raninus* Linnaeus, 1758
This species, once thought to be rare, is probably under-recorded due to its solitary existence in the kelp beds below low tide mark. Only 1 (2.7%) specimen found during the survey period.

Viviparous blenny. *Zoarces viviparus* Linnaeus, 1758
A common, resident member of the estuary fauna, recorded on 24 (64.8%) visits.

Sand-smelt. *Atherina presbyter* Valenciennes, 1835
Scarce in the Blyth estuary, being recorded on only 2 (5.4%) occasions. Possibly overlooked due to its small sizıe, although on both occasions only one individual has been found despite extensive searching.

Fifteen-spined stickleback. *Spinachia spinachia* Linneaus, 1758
Essentially a species of rocky, algal-covered shores, this species has only been recorded 3 (8.1%) times, following periods of heavy seas.

Greater pipefish. *Syngnathus acus* Linneaus, 1758
Regarded as a moderately common species in shallow water over sandy or muddy bottoms, this pipefish has been recorded only on 2 (5.4%) occasions.

Tub Gurnard. *Trigla lucerna* Linnaeus, 1758
A gurnard which is usually found in shallow inshore waters but regarded as rare on the north-east coast of England. Only one specimen (2.7%) of this handsome species has been recorded, in November 1980.

Grey Gurnard. *Eutrigla gurnardus* Linnaeus, 1758
Usually found offshore on the north-east coast, where it is the most common gurnard. Recorded on 1 (2.7%) visit to the estuary only, in October 1979.

Bull-rout. *Myoxocephalus scorpius* Linneaus, 1758
Recorded on 4 (10.8%) visits, this species is very common between tide marks on the north-east coast and is probably resident in small numbers in the estuary of the River Blyth.

Sea scorpion. *Taurulus bubalis* Euphrasen, 1786
A far more common sculpin than the bull-rout. It was recorded 11 (29.7%) times and may be regarded as a resident member of the estuary fauna. It is usually associated with rocky shores and dense algal growth, and it is perhaps a little surprising to find it in such numbers in a muddy estuary.

Pogge. *Agonus cataphractus* Linneaus, 1758
A common fish of inshore waters on sandy bottoms, this species was recorded on 10 (27.0%) visits, normally in small numbers. Probably a resident species, although there are few records from February to August.

Lumpsucker. *Cyclopterus lumpus* Linnaeus, 1758
The characteristic inshore movement of this species associated with spawning is evident from its occurrence on 5 (13.5%) occasions from March to May.

Montagu's sea snail. *Liparis montagui* Donovan, 1805
A small species of rocky shores which has only been recorded on 1 (2.7%) visit, which followed stormy weather. Probably under-recorded due to its small size.

Bass. *Dicentrarchus labrax* Linneaus, 1758
A relatively uncommon species on the north-east coast, bass has been recorded on only 1 (2.7%) occasion from the Blyth estuary.

Scad. *Trachurus trachurus* Linneaus, 1758
An offshore, pelagic fish which usually occurs in vast shoals. The occurrence of scad in the estuary during the summer months on 2 (5.4%) occasions is an indication of the spawning migration of this species into the North Sea from the south.

Ray's bream. *Brama brama* Bonnaterre, 1788
The migration of Ray's Bream down the east coast of Britain in the autumn and winter months has been well documented (see Davis & Dunn, 1980, p 42), specimens regularly being stranded on the Northumberland and Durham coastline from mid-October to early December. The single (2.7%) occurrence of the species in October 1979 is consistent with this pattern of movement.

Thick-lipped grey mullet. *Chelon labrosus* Risso, 1826
A species which has probably been under-recorded in the past, occurring in large shoals in the summer months at selected localities in Northumberland (Taylor, pers. comm.) However, it would appear to be scarce in the Blyth estuary, only 1 (2.7%) specimen being found during the survey period, in February 1980.

Lesser Weever. *Echiichthys vipera* Cuvier, 1829
A common, resident member of the estuary fauna, recorded 15 (40.5%) times.

Shanny. *Lipophrys pholis* Linnaeus, 1758
A common fish on rocky shores in Northumberland. Possibly under-recorded (1 (2.7%)) because of its small size.

Butterfish. *Pholis gunnellus* Linnaeus, 1758
A very common species on rocky shores on the Northumberland coast, yet found on only 4 (10.8%) occasions. It is possibly under-recorded due to its small size.

Sand eel. *Ammodytes tobianus* Linnaeus, 1758 and Greater sand eel
Hyperoplus lanceolatus Lesauvage, 1824
In the initial survey period all sand eels found were recorded as *Ammodytes*, but re-examination of preserved specimens has shown that *Hyperoplus* is also present in the estuary. Because of this oversight it is impossible to comment on the relative status of the two species and their seasonal distribution. However, sand eels as a group are almost certainly resident members of the estuary fauna, occasionally present in large numbers. Recorded on 14 (37.8%) visits.

Dragonet. *Callionymus lyra* Linnaeus 1758
Only one specimen (2.7%) of this fish was taken from the intake screens in May 1980, although it is relatively common offshore.

Sand goby. *Pomatoschistus minutus* Pallas, 1770
Recorded on 9 (24.3%) occasions, this small goby must be considered as a common member of the estuary fauna. Few specimens were obtained from April to September, suggesting a migration to deeper water during the summer months.

Mackerel. *Scomber scombrus* Linnaeus, 1758
This common visitor to the north-east coast in the summer months has surprisingly been recorded from the intake screens only once (2.7%), and that a single specimen in February 1980. It may be that this powerful-swimming fish can escape the pull of the intake, leading to an erroneous picture of its status in the estuary.

Plaice. *Pleuronectes platessa* Linnaeus, 1758
A very common, resident member of the estuary fauna, recorded on 29 (78.3%) occasions.

Flounder. *Platichthys flesus* Linnaeus, 1758
Very common in the River Blyth estuary, being recorded on 24 (64.8%) visits. Found throughout the year. Hybrids between Plaice and Flounder have also been found frequently.

Dab. *Limanda limanda* Linnaeus, 1758
A common species, recorded on 11 (29.7%) occasions. Surprisingly few specimens have been found during the summer months when an inshore migration might be expected.

Lemon Sole. *Microstomus kitt* Walbaum, 1792
Primarily an offshore species, Lemon Sole has been recorded only once (2.7%) from the Blyth estuary during the survey period.

Sole. *Solea solea* Linnaeus, 1758
Recorded on only 2 (5.4%) occasions from the intake screens, both specimens being juveniles.

During the survey period a total of 49 species of fish has been recorded. The 'percentage occurrence' figures give some indication of the relative status of the species, and four categories are recognized:

Rare species (recorded on less than 10% of visits)
Sea lamprey; Lampern; Hagfish; Starry smooth hound; Spurdog; Conger; Salmon; Trout; Angler; Bib; Pollack; Ling; Tadpole fish; Sand smelt; Fifteen-spined stickleback; Greater pipefish; Tub gurnard; Grey gurnard; Montagu's sea snail; Bass; Scad; Ray's Bream; Thick-lipped grey mullet; Shanny; Dragonet; Mackerel; Lemon Sole; Sole.

Uncommon species (recorded on 10–25% of visits)
Starry ray; Five-bearded rockling; Bull rout; Lumpsucker; Butterfish; Sand Goby.

Common species (recorded on 25–50% of visits)
Eel; Cod; Long-spined sea scorpion; Pogge; Lesser Weever; 'Sand eel'; Dab.

Very Common species (recorded on more than 50% of visits)
Herring; Sprat; Whiting; Saithe; Viviparous blenny; Plaice; Flounder.

The occurrence of the common and very common species was consistent with expected results, indicating resident fish (e.g. Lesser Weever and Viviparous blenny) and those showing marked seasonality (e.g. Cod, Sprat).

The rare and uncommon categories however include a number of unexpected results. Records of occurrence tend to over-emphasize the importance of the rarer species, many of which are represented by a single specimen. Quantitative sampling is obviously desirable in future work to obtain a more objective view of the relative status of species. In spite of these deficiencies in technique it is interesting to note the occurrence of fish regarded as rare (Starry smooth hound) or at the limits of their range (Starry ray). Other species (Sea scorpion; Hagfish) simply appeared much more frequently than had been expected, whilst others (Bib, Sand smelt, Mackerel) appeared less frequently than expected. Indeed, some species which might have been predicted to appear have not been recorded at all — Lesser-spotted dogfish and Thornback ray for example.

Several factors may have had an influence on the results obtained. Weather conditions preceding visits to the site would appear to influence the number and diversity of fishes recorded — rough seas provided optimum collecting conditions, resulting in the presence of deeper water

fish or those usually found in the sublittoral zone. This might be expected considering the normally relatively sheltered nature of the Blyth estuary in the vicinity of the power station. The effects of such climatic factors probably deserve greater consideration in future studies. The relationship between wind direction, velocity and fish catch is probably a complex one — for example Holmes (1975) data suggested that fish and weed catches were higher at Fawley power station after strong south-westerly winds, although this direction was actually away from the screens. Research at Dungeness Power Station (Turnpenny and Utting 1980) revealed no correlation between wind velocity and direction and the number of fish (sprat, *Sprattus sprattus*) impinged.

No attempt was made by the authors to examine the effects of tides on fish capture, or diel patterns of fish impingement. These factors have been discussed by Turnpenny & Utting (1980) and Langford *et al* (1977).

The ability of smaller fish to remain undetected or to escape unscathed from the intake collecting pits has almost certainly influenced the results. Although a diligent search has been made by the authors on each visit, undoubtedly small fishes will have escaped the attention of the pump-house staff, whose interpretation of 'unusual' or 'interesting' is equated with 'large' or 'strange-looking'. Butterfish and Five-bearded rockling have been often found alive in the collecting trays, and can easily escape through the coarsemesh — for this reason it is probable that both these species are under-recorded. In addition, data for the more edible species may be biased. Quite understandably, salmon, trout and cod were rarely found in the container of preservative.

The intake and revolving grids sample selectively for small individuals of all species. Fish will be trapped only if they are unable to swim against the inflow through the entrance tunnel. Holmes (1975) suggests that small fish such as sprats *Sprattus sprattus* or weak swimmers such as lumpsuckers *Cyclopterus lumpus* are unlikely to be able to escape but larger and more powerful fish such as bass *Dicentrarchus labrax*, may be able to do so. Results obtained at Blyth would appear to support this view.

There was a marked increase in the numbers of species and individuals impinged at Blyth during winter and spring, sprat *Sprattus sprattus*, whiting *Merlangius merlangus* and saithe *Pollachius virens* making up the bulk of the catch. In contrast, few species were captured in May, June and July. This pattern is similar to that described by Langford *et al* (1977). In part this summer decline reflects the seasonal migration of certain species out of the River Blyth estuary and away from the threat of impingement. However, fewer specimens of those fish thought to be resident are caught. The swimming ability of fish is related to water temperature, and may be a key factor affecting impingement (Blaxter, 1969). Thus at higher water temperatures during summer months, fish are able to withstand water currents more effectively and escape impingement.

Preliminary observations at Blyth have highlighted a number of interesting questions — both about the fish fauna and the ability of the intake of the power station to act as an effective sampling device of the species present. However, the results are encouraging, and further work will continue, with an added dimension of quantitative assessment.

Acknowledgements

Our thanks are due to Dr Roger Bamber of the C.E.G.B. Marine Research Laboratory, Fawley, for drawing attention to the opportunities presented by the intake screens. Dr Terry Langford, Head of the Marine Biological Laboratory at Fawley, provided instructive help and guidance, and commented on a draft of the manuscript. Without the assistance of staff at Blyth Power Station the project would have been impossible, and Mr T. Bell of the Laboratory staff gave invaluable assistance. Our special thanks are due however to the specimen collectors of the pump house, in particular J. Rump, N. Marriot, W. Stewart, and N. Douglas. Mr Alwyne Wheeler of the British Museum (Natural History) commented on the manuscript, and we are grateful for his invaluable advice and encouragement.

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BOOK REVIEWS

Cultural Transmission and Evolution: A Quantitative Approach by **L. L. Cavalli-Sforza** and **M. W. Feldman**. Pp. xiv + 383 including graphs and diagrams. Monographs in Population Biology, 16. Princeton University Press. 1981. Approx. £10.50 hardback, approx. £5 paperback.

The concepts of organic evolutionary theory are used by the authors as starting points for an attempt at theoretical explanation of cultural change in human populations. The difference between cultural transmission and classical biological transmission is acknowledged and interactions are investigated; the former is studied in order to provide a theoretical framework for future investigation in quantitative anthropology and social science. Mathematical methods have been developed for quantitative study of modes of cultural transmission. Although it is claimed to be intelligible to those with a knowledge of elementary calculus and simple algebra, the equations which occur on a high proportion of its pages are unlikely to encourage anyone without considerable mathematical fluency to read the book. The authors indicate that man is not alone in possessing culture, but the empirical support which ethology can provide for theoretical arguments concerning transmission and mutation of units of culture (e.g. the report of Slater, P. J. B. and Ince S. A. (1979) in *Behaviour*, **71**, 146–166, on 'Cultural Evolution in Chaffinch Song') is not adduced. The development of a theory of culture in all animals is potentially a major growth area and ethologists should find much of interest in this book. The work will be essential reading for academics in the field of human cultural evolution, many of whom are cited in the comprehensive bibliography

DJH

Leaves from a Moth-Hunter's Notebook by **P. B. M. Allan**. Edited and with an introduction by **R. S. Wilkinson**. Pp. 281 + frontispiece. E. W. Classey Ltd, Faringdon, Oxon. 1980. £9, post free.

P. B. M. Allen was born in Scarborough in 1884 and died, at the age of eighty-nine, in 1973. This posthumous publication is a collection of papers, mainly serious, but at times rather less so, on a range of topics connected with butterflies and moths. The possible occurrence of the Middle Copper in the West Country is discussed and other chapters deal with the Mazarine Blue and the Scarce Swallow-tail butterfly. There is much to interest the non-entomological naturalist and the short chapter headed 'Wishful Thinking' should be read as a cautionary lesson by anyone who considers that they might have seen this, that, or the other, and the rarer the better!

The distinctive literary style of the 'Old Moth-Hunter' is a delight to read — he must have been a grand old man to know.

RC

INTERTIDAL MITES FOUND IN ASSOCIATION WITH *SEMIBALANUS BALANOIDES (L.)* AND *MYTILUS EDULIS (L.)* AT ROBIN HOOD'S BAY, YORKSHIRE

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The rocky shore at Robin Hood's Bay provides attachment for mussels, a substrate for algae and a suitable surface for the settlement of barnacles. Intertidal mites, which do not belong to any one family or group of the Acarina, have been studied by several workers abroad but apart from the work of Halbert (1915, 1920), Evans and Browning (1953) and Green (1956, 1960) little work has been carried out in this country, especially on the east coast of Britain. Systematic and ecological studies on littoral mites abroad include important works by Newell (1947) and Bartsch (1972).

Semibalanus balanoides

The shell plates of *S. balanoides* provide a rough textured surface which supports an epiflora of microscopic algae shown to be a complex of species belonging to several genera (Stubbings, 1975) which are browsed by a variety of mites.

The Acarine fauna is dominated by two species, *Ameronothrus marinus* (Banks) and *Hyadesia fusca* (Lohmann), both of which are present throughout the year and abundant in the summer months. These species are from the Cryptostigmata and Astigmata respectively which form almost entirely terrestial groups of mites.

A. marinus carries epiphytic algal growths on its legs, especially heavy on the proximal segments. The alga has been identified as *Pseudulvella* sp., a discoid green alga which characteristically grows on certain animals. Schulte (1976) demonstrates that this mite is an algal feeder.

Bénard (1961) described two new species of *Hyadesia* from barnacles on the northern coast of France and found the intestine of the mites contained green unicellular algae, bacteria and diatoms.

In Sweden, according to Ganning (1970), *H. fusca* is restricted to the green alga *Enteromorpha* but has not been found on this alga at Robin Hood's Bay.

Frederickson (1966) recorded *A. marinus* from *S. balanoides* in the littoral region of New York City. Both species may play an important role in controlling algal growths on barnacles, although Fredrickson (1966) implied no symbiotic association. According to Stubbings (1975) there are no records of true commensalism with *S. balanoides*. A further explanation for the close association of these two species with barnacles may arise from the fact that barnacles, especially empty barnacle shells, provide crevices in which air is trapped during high tide, thus allowing these species to survive.

Amongst the Halacarid mites listed in Table 1, *Lohmannella falcata* (Hodge) is a predacious form, unlike the other species which are algal feeders. Green (1956) records *Rhombognathus magnirostris* Trouessart and *Metarhombognathus armatus* (Lohmann) among barnacle scrapings at Port Erin, Isle of Man.

Mytilus edulis

Halacarid mites have also been found in the mud and silt which collects between individual mussels which grow in patches on the shore. No Cryptostigmatid or Astigmatid mites were found. The mussel infauna contains both predatory and algivorous mites; the former include *Thalassarachna basteri* (Johnston), *L. falcata*, and *Copidognathus* sp. Green (1960) lists all the species recorded in Table 2 as having been found around the British Isles.

TABLE 1
Mites associated with *Semibalanus balanoides*

Cryptostimata
Ameronothridae
Ameronothrus marinus (Banks)
Astigmata
Hyadesiidae
Hyadesia fusca (Lohmann)
Prostigmata
Halacaridae
Rhombognathides seahami (Hodge)
Rhombognathus magnirostris Trouessart
Metarhombognathus armatus (Lohmann)
Isobactrus setosus (Lohmann)
Lohmannella falcata (Hodge)

TABLE 2
Mites associated with *Mytilus edulis*

Prostigmata
Halacaridae
Rhombognathides mucronatus (Viets)
Rhombognathides seahami (Hodge)
Metarhombognathus armatus (Lohmann)
Copidognathus sp.
Thalassarachna (=Halacarellus) basteri (Johnston)
Lohmannella falcata (Hodge)

It is clear from the work of previous authors and the records of collections from elsewhere on the shore at Robin Hood's Bay, especially on the large brown algae, that the Halacarids listed in Tables 1 and 2 are common and widespread intertidal species. It is likely that other Halacarid species will be found. Conversely both *A. marinus* and *H. fusca* are far more restricted in their distribution and have so far only been found in association with barnacles.

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SOME ASPECTS OF THE BREEDING BIOLOGY OF THE PIED FLYCATCHER *FICEDULA HYPOLEUCA* IN A NORTH YORKSHIRE WOODLAND

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The Pied Flycatcher is a species which has long attracted the attention of bird watchers in both Britain and Europe and consequently its status has been well documented. In Britain, it is restricted almost completely to deciduous woodland in upland valleys, together with alder and birch woods alongside rivers, streams and lochs. As illustrated by Sharrock (1976), its stronghold is the sessile oakwoods of Wales and Northern England, the birds breeding on the North Yorkshire Moors forming an isolated population.

Nelson (1907) gave the first detailed account of the distribution within the county. Chislett (1952) offered further data and Campbell's surveys (1954, 1965) have allowed a reasonably complete picture to be drawn. It would appear that during the nineteenth century, when there were still established deciduous woodlands in the north draining valleys, Pied Flycatchers were well distributed throughout the valleys of the North Yorkshire Moors. Felling of timber in most of these northern valleys has subsequently resulted in a contraction of the range and the species is now more or less confined to the southern valleys.

Duncombe Park, situated on the outskirts of Helmsley, has been known as a favoured haunt since Nelson's day. The steeply sloping banks of the River Rye hold some fine stands of deciduous timber planted during the eighteenth century. These are gradually being felled and the land replanted — there has been a significant reduction during the course of this study — but the area is still capable of holding a substantial population of Pied Flycatchers. During the winter of 1971/72, some 40 nesting boxes were erected in these woodlands and these have been increased over the years to approximately 100 boxes in 1980.

The number of pairs using the boxes, together with annual productivity is presented in Table 1. This data is a summary of the basic information which has been used in this analysis.

Breeding Density

The nesting boxes at Duncombe Park are in three discrete areas. The majority are situated on the steep slopes along the north bank of the Rye, with lesser numbers on the opposite bank and in more open country near the school. From annual estimates of the total area boxed in each of the years 1976–80, the density was found to vary from 1.5 pairs per hectare in 1979, which was a year of low occupation, to 2.1 in both 1977 and 1978. These figures, which may be on the low side since they will not include birds breeding in natural sites, compare favourably with those quoted by Lack (1966), the extremes of which were 0.2 in Finland and 4.9 in Germany. Since the introduction of boxes however, very few birds have been noted breeding in natural sites and so the above values are probably a true indication of the density.

TABLE 1

Details of Annual Productivity

	1972	1973	1974	1975	1976	1977	1978	1979	1980	Mean
Number of boxes	40	82	77	78	88	106	106	103	104	
No. occupied by Pied Flycatchers	5	19	21	21	14	26	26	18	20	
% occupied by Pied Flycatchers	13	23	27	27	16	25	25	16	18	
Number of eggs laid	32	129	126	135	90	174	178	116	129	
Average clutch size	6.4	6.8	6.0	6.4	6.4	6.7	6.8	6.4	6.5	6.5
Number hatched	29	?	82	115	82	150	158	88	107	
Number ringed	29	90	72	97	77	105	143	79	101	
Number fledged	28	60	66	78	78	104	130	84	101	
% success	88	47	52	58	87	60	73	72	78	
Number young reared per pair	5.6	3.2	3.2	3.7	5.6	4.0	5.0	4.7	5.0	4.3

Timing of Breeding Season

Although the first males usually arrive towards the end of April, it is some two weeks later before nest construction and egg laying commence in earnest. The actual commencement of egg laying varies little from year to year, as is exemplified in Table 2 which presents the mean first egg dates for Blue *Parus caeruleus* and Great Tits *P. major* as well as Pied Flycatchers. This is contrary to the findings of Lack (1966) in the Forest of Dean who found that mean first egg dates varied from fifth to the twenty-second of May during his sixteen-year study. He also established a correlation between the first laying of Pied Flycatchers and those of Great Tits, both of which could be related to the average temperature during March or April. This has not been established in this study although 1977 was a particularly late season for all three species whilst 1980 was exceptionally early.

Nest Box Selection and Nest Construction

Each year there are a number of nests which are partially constructed but never used. Some of these are in boxes adjacent to those occupied by another pair of Pied Flycatchers and so are probably the result of an indecisive male or female. However, some of these unused nests are in boxes near which males have been heard singing and it is assumed that they have commenced construction awaiting the arrival of a female. These males are easily identified since they continue singing well into the breeding season and have been known to construct virtually complete nests.

Most nests are constructed of dried grasses and oak leaves with finer grasses being used for the lining. In contrast to Redstarts *Phoenicurus phoenicurus* in this part of Yorkshire, feathers are never used. The cup of the nest is invariably situated to the rear of the box (as far away from the hole as possible), usually in one of the corners.

TABLE 2

Mean First Egg Dates

		1973	1974	1975	1976	1977	1978	1979	1980
Blue Tit	May	8	8	9	11	14	12	17	—
Great Tit	May	14	11	11	12	19	13	17	
Pied Flycatcher	May	21	21	21	18	23	21	21	18

PRODUCTIVITY

The basic data relating to clutch size and productivity are presented in Table 1. Although the majority have a clutch size of six or seven, in most years an occasional pair may have as many as nine or as few as four. These latter could be repeat layings which are discussed below.

The incubation period has been found to be 13–14 days from completion of the full clutch and the fledgling period is 14–15 days.

Breeding success in total tends to vary somewhat from year to year as can be seen in Table 1. This can be due to a number of reasons, some of which are highlighted below:

1973 — 23 per cent of young died in the nest after being ringed. This was thought to result from a period of heavy rain during mid-June.

1974 — Substantial egg predation by small mammals with 35 per cent of eggs failing to produce young.

1975 — 20 per cent of young died after being ringed — mainly late in the season when food may have been in short supply.

1976 — Although the population was relatively low, the fine hot summer resulted in a most successful breeding season.

1977 — A large number of young (26 per cent) died prior to being ringed, probably as a result of adverse weather limiting the food supply.

In addition to natural hazards such as predation and adverse weather, it has been observed that both clutch size and breeding success are influenced by the date when laying commences. Fig 1 shows how the mean clutch size and the average number of young fledged per brood decreases as the season progresses. This is obviously linked to food availability, since the later clutches often fail to produce any young at all, and explains why the breeding season is so remarkably synchronized.

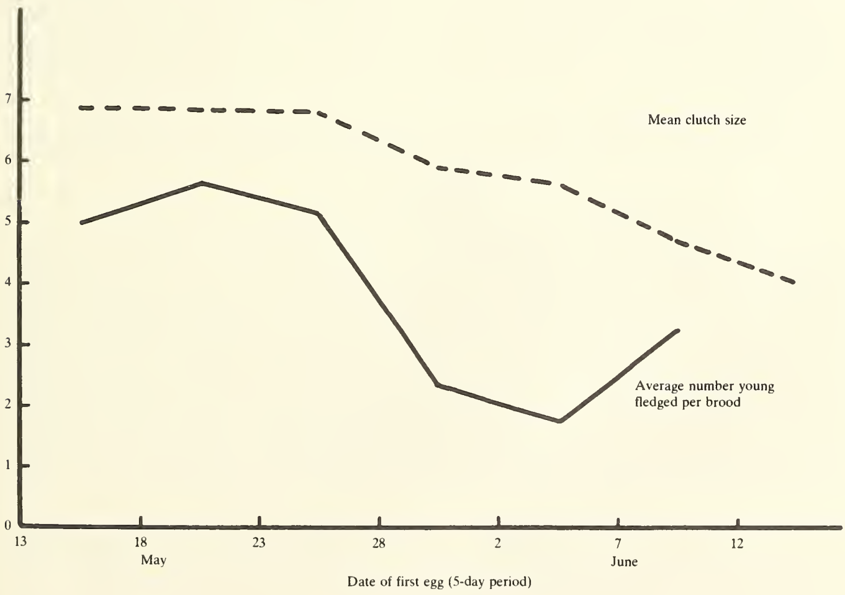

FIGURE 1
Change in productivity during breeding season.

Survival and Loyalty to Natal Colony

From Table 1 it can be seen that one pair of Pied Flycatchers produces on average just over four young per season. By catching breeding adults it has been possible to show that providing the population remains stable, the survival rate for adult females (one year old or over) is 55 per cent whilst for juvenile females it is only 21 per cent. Of these surviving 21 per cent only half return to their natal colonies; the remainder presumably breed in nearby localities. This is supported by the fact that four birds ringed as nestlings in Duncombe Park have been re-trapped whilst breeding at Sleightholmedale in subsequent years, and three birds ringed at Sleightholmedale have also been re-trapped at Duncombe. The distance between the two sites is nine kilometres.

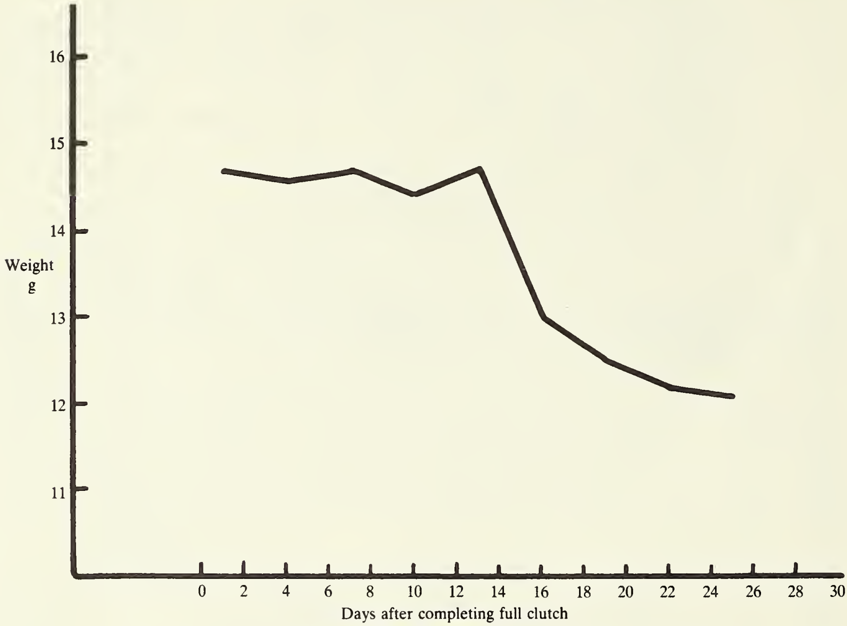

FIGURE 2

Mean weights of female Pied Flycatchers during breeding season.

Weight Changes in Adults during the Breeding Season

The mean weights of the many females trapped during the breeding season are presented in Fig 2 from which it can be seen that whilst incubating they average three g heavier than normal. This excess weight is rapidly shed when they start feeding young. Although the mean weights (three-day means) clearly show this pattern there is considerable variability, particularly during incubation, and attempts have been made to correlate this with other factors. Neither the age of the female nor the timing of laying appear to influence the ability of the female to increase in weight during incubation, although there are only limited data available concerning birds of known age. However, there does seem to be some correlation between this phenomenon and the number of eggs laid. The significance of this is not understood at present.

From the data collected over nine years of study and discussed briefly above, it is possible to draw the following conclusions:

1. The breeding population of Pied Flycatchers in nesting boxes in a North Yorkshire woodland is approximately two pairs per hectare.
2. The timing of the breeding season, as measured by mean first egg dates, varies only within narrow limits; the relationship to the timing of the tit breeding season is not understood.

3. Clutch size is generally six or seven, with extremes of four and nine, but decreases as the season progresses.
4. Incubation period is 13–14 days; fledgling period 14–15.
5. Productivity is variable dependent on a number of factors; on average four young are reared per pair.
6. Attempts have been made to calculate survival rates for adult and juvenile females. These have been found to be approximately 55 and 21 per cent respectively with only half the surviving juveniles returning to their natal colony.
7. Females increase in body weight by some 25 per cent during incubation. Weight falls to a normal level very quickly after the eggs hatch. The ability of the female to put on weight during incubation appears to be related to the number of eggs laid.

Acknowledgements

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FIELD NOTES

The first record of the Barbastelle *(Barbastella barbastellus)* in Yorkshire

In my paper Mammal Studies in Yorkshire — a review *Naturalist* **105**:81–87 (1980) I made an unfortunate error in the date of the first occurrence — this should have read 1920 not 1930 as printed. Mr Charles D. Milne who, with his brother, found the first bat, a female, near Helmsley Castle in August 1920 sent me the correct details of the occurrence.

In 1921 Mr Adam Gordon and Mr H. B. Booth found two colonies in Helmsley Castle. Three bats from the Castle, two males and a female collected on 28 July 1921, are in the Adam Gordon Collection which is now in the Yorkshire Museum as is the first county record.

I am grateful to Mr C. D. Milne for pointing out the error in my paper.

T. M. Clegg

***Mimas tiliae* (Linn.) The Lime Hawk-moth in North Humberside**

A single, fresh male specimen of *Mimas tiliae* (Linn.) was found by Mr J. Bradshaw in Victoria Avenue, Hull on 15 June 1981, and was brought into Hull Museums. This species is of rare occurrence in North Humberside, where it is at the northern limit of its east coast range. The specimen was released after identification.

S. A. Moran

BOOK REVIEWS

The Mammals of Britain and Europe by **Gordon Corbet** and **Denys Ovenden**. Pp 253, with 62 colour plates and numerous line drawings. Collins. 1980. £3.95.

A Field Guide to the Mammals of Africa including Madagascar by **T. Haltenorth** and **Helmut Diller**. Pp 400, with 63 colour plates and numerous line drawings and 245 distribution maps. Collins. 1980. £8.95.

These are two guides dealing with European and African mammals that fill a common purpose, providing information on the identification, distribution and habits of these animals.

Corbet and Ovenden's volume is the more informative as there is much supplementary information on tracks, skulls and scans of selected species. The distribution maps cover Europe and, in more detail, the British Isles, while the colour plates of individual animals are clearly presented so as to show diagnostic features to advantage. The artistry is of a high standard and the inclusion of many small vignettes greatly enhances the attraction of the book.

The richness of the African fauna, which is less well known than that of Europe, confronts the authors with a much sterner task in the accumulation and presentation of information. This difficulty has been partly alleviated by omitting the bats and most of the rodents and insectivores. Nevertheless over 300 species are described in this excellent account. Once again the colour plates are of high quality and provide an invaluable complement to the text.

Both these field guides are modestly priced and essential to the naturalist interested in mammals in these two continents.

MJD

Wild Animals of the World by **Maggie O'Hanlon** and **Doreen Edmond**. Pp 168, including 48 pages in colour. Blandford. 1981. £4.95.

A small, attractive book that I find difficult to recommend. *Wild Animals of the World* turns out to include only mammals (why not 'Wild Mammals of the World'?) and a curious selection of only 250 species at that. There are in fact more than six species of mammals in the oceans, and five in the Asian grasslands, but this book does not say so, nor does it explain why the particular selections were made. A short introduction discusses mammals, environments and adaptations, and the eight chapters forming the bulk of the book introduce the species according to environments (Polar Regions, Coniferous Forests, Deciduous Forests, etc) and continents. I cannot agree with several of Maggie O'Hanlon's statements about animals and environments I am familiar with. Tundra is by no means a desert, for example, and Weddell seals are not — despite their name — found particularly in the Weddell Sea. Brown bears are indeed found in the USSR, Scandinavia and the Balkans, but not only there; what of the populations in the Pyrénées, Switzerland and Italy? If the European polecat 'ranges over most of Europe', why is it introduced under 'Mediterranean Scrub' — hardly its most typical habitat. Giant pandas are more likely to be grouped with bears than with raccoons these days — these are all small points, perhaps niggling ones, but they add up to an unfortunate impression of hasty compilation rather than authority. Doreen Edmond's illustrations are colourful and lively, and there are good indexes.

BS

Keith Brockie's Wildlife Sketchbook, with a foreword by H.R.H. The Duke of Edinburgh. Pp xxiii + 130, including coloured illustrations. Dent. 1981. £9.50.

An attractive portrayal of Scottish wildlife as captured by the pen and brush of a young artist. His sketches of animals, and to a lesser extent plants, are delightfully life-like, but his landscapes and seascapes do not display the same delicate quality. The annotations reflect some observational insight, but the somewhat immature handwriting detracts from the impact of the illustrations. A pleasant and colourful birthday gift, but of limited interest to the naturalist seeking to extend his knowledge.

Operation White Lion by **Chris McBride**. Pp 159, with 1 figure and 51 colour plates. Collins & Harvell. 1981. £8.50.

This is an account of the location and capture of the white lions inhabiting Timbavati Reserve in South Africa. The motive for the exercise is the protection of some of these unique animals which, it is believed, could be in danger from members of their own species.

The first part of the book, dealing with the search for the lions, is rather drawn out. It would have been improved had it included more lively personal reminiscences and given the reader a greater feeling of identity with the local situation. This is not helped by the style of writing which lacks fluency. Fortunately, the latter part of the story builds up to an interesting climax when the lions are being captured.

The wildlife photographs are of high quality and do considerable credit to the author's photographic skills.

AVD

The Year of the Greylag Goose by **Konrad Lorenz**. Pp 199, including many colour photographs. Eyre Methuen. 1981. £3.95 paperback.

Immaculately produced paperback version of Lorenz's classic, with superb photography by Sybille and Klaus Kalas. This book is an account of work done by Lorenz and his colleagues during his 'retirement' in the Alm Valley, Austria. It covers studies of greylag geese, beavers and many other species, written up with the insights and sympathy that always characterize this writer's work. The photographs alone would make the book worth while; text and plates together make a delightful combination. Strongly recommended for students, inarticulate scientists, ornithologists, photographers, nature-lovers, aunts, children, pensioners — in fact anyone who appreciates a good book when they see one.

BS

Birds — Their Latin Names Explained by **A. F. Gotch**. Pp 348, Blandford Press, 1981. £10.95.

This is a companion volume to an earlier one by the same author, *Mammals — Their Latin Names Explained*. In this book the origins of the Latin names of 1850 species of the commoner and more interesting birds are explained. Like his former book, it is authoritative and extremely interesting, and should be welcomed by all with an interest in ornithology.

One can spend moments reading through the origins of the scientific names of the member species of a particular Order, as well as returning time and again to use it as a reference book.

It costs more than the work on Mammals, but deals with about 800 more species. As in the earlier book I wish that Greek words had been printed with Greek letters, but this is a very minor criticism.

RJP

The Evolution of Eukaryotic Cells by **Michael A. Tribe, Andrew J. Morgan** and **Peter A. Whittaker**. Pp 60, with 34 figures (photographs and diagrams). *Studies in Biology No. 131.* Edward Arnold. 1981. £1.95 paperback.

An introduction to the opposing views concerning the origins of eukaryotic cells is provided by the authors. Did such cells first evolve partly or entirely through endosymbiosis, their organelles representing the vestiges of earlier free living bodies? Or, did they evolve from prokaryotes by progessive accumulation of advantageous mutations? The aim of the book is to 'outline the theories and to appraise impartially the evidence currently available'. Impartiality is the keynote: perhaps the authors are too impartial. The fourth and last chapter entitled 'Summary and Conclusions' does not include a statement of their own pet theory; perhaps they disagree.

Numerous matters are raised which require too much prior knowledge. For example the 'techniques of sequencing and oligonucleotide cataloguing' are stated to be of 'particular value in

providing a truly quantitative basis for determining phylogenetic relationships between groups of organisms'. A number of the electronmicrographs will also present some readers with difficulties. Sections are not always captioned as such, and are not comprehensively labelled. However, the authors' combination of expertise has ensured that few stones have been left unturned in the search for relevant material, and the book may be particularly recommended on this account.

DJH

The Descent of Man, and Selection in Relation to Sex by **Charles Darwin**. Reprint of the 1871 edition with an introduction by **John Tyler Bonner** and **Robert M. May**. 2 vols in 1: Pp xli + vi + 423 (including 25 figures); ix + 475 (including 51 figures) + iv (table). Princeton University Press. 1981. £7.75 paperback.

A reprint of the entire first edition (first issue), rather than a subsequent issue of 1871 or the second edition of 1874, has been chosen by Bonner and May because 'Darwin had an unfortunate habit, in his revisions, of rewriting some of the freshness out of the initial work. He was very sensitive to criticism, and tried hard to satisfy all his critics by making appropriate alterations and accommodating conflicting points of view'. However, a table of the principal additions made since the first issue, taken from the 1913 edition, follows the index in the present work.

The critical introduction to this reprint analyses the content, development of ideas, scientific method and style of presentation of *The Descent of Man*, and presents a section on 'some scientific problems confronting Darwin's work in the nineteenth century'. The introduction also considers Darwin's book in relation to present day research. Bonner and May make out a good case for abridging this lengthy work as follows: chapters 1 to 8 and 19 to 21 are recommended as basic reading, resulting in no loss of the ideas or flavour of the book.

The reprinting of the original first issue of this work, not previously available in paperback, is particularly timely in view of the current resurgence of interest in Darwinism.

MRDS

The Biology of Mosses by **D. H. S. Richardson**. Pp xii + 220, including numerous line drawings, tables and b/w plates. Blackwell Scientific Publications. 1981. £9.80 paperback.

This is an excellent and comprehensive treatise on mosses, which occur world wide, extending from the extreme north of Greenland through the tropics to the ice-free areas of the coast of Antarctica.

All aspects of the life-history of mosses are treated with remarkable thoroughness. Their growth, reproductive mechanism, their habitats from aquatic environments to bleak sites on mountains are adequately explained and illustrated. Chapters are devoted to moss-animal associations and to the attacks on the various species by bacteria, fungi and algae. The ecology of mosses is explained, and how they cope with various environments from hot springs to arid deserts. A more modern threat to their life and well-being is air pollution, and the draining of the wet lands of the world; peat extraction also poses a danger to many species of *Sphagnum*. The uses of mosses by man are described and there is a long list of bird species that use mosses in their nest construction.

Each chapter (12 in all) ends with a long list of references for further reading. There is a wealth of information on all aspects of bryology and much besides. No serious student of bryology should be without this comprehensive book.

ECW

The Wild Flower Key. A Guide to Plant Identification in the Field, With and Without Flowers by **Francis Rose**. Pp 480, including numerous coloured plates and line drawings. Warne. 1981. £8.95 cased, £5.95 limp.

This field guide to flowering-plant identification contains a wealth of informative and organized material derived from a lifetime's experience by one of Britain's foremost botanists. More than 1400 species from northwest Europe (including the British Isles, the Channel Islands, northern France, Belgium, Luxembourg, Holland, Denmark, and northwest Germany) are described and about 1000 of them are illustrated in full colour.

All native and long-established species are fully covered, with the exception of many grasses, sedges and rushes, a few critical groups of species, and rarer species outside the British Isles, which receive more limited attention. Well-established garden escapes (mainly in the British Isles) receive partial coverage.

Each species is described in an average of 40–50 words, but this is achieved through an excessive use of abbreviations (made more difficult to interpret by a house-style which abandons the full-stop) and some jargon, which is not defined in the glossary. The former must be accepted since without this a larger format or more pages would have been an encumbrance to the fieldworker. The nomenclature is based on Clapham, Tutin and Warburg (1962) and numerous names are now out-of-date; only a few synonyms are provided.

Dichotomous keys (sometimes supplemented by line-drawings) provide the main means of identification. These include vegetative keys which are a most useful adjunct to the usual guide. For many, however, the illustrations will provide the most direct approach to identification: on the whole these have been carefully chosen by the author and skilfully prepared by the artists, and in only a few instances are the colours unnatural or the inking too strong (as in the case of hairiness).

This book can be recommended not only to the serious student of botany but also to those with a more general interest in plants and the countryside.

MRDS

Wild Flowers and Other Plants of the Peak District by **P. Anderson** and **D. Shimwell**. Pp 192, including numerous b/w plates and figures. Moorland Publishing, Ashbourne, Derbyshire. 1981. £6.95.

This very readable work packed with information is not, as the title might imply, a layman's flora, but an account of the changing flora of 500 or so square miles of the southern Pennines.

After an outline of the history and ecology of the area, separate sections introduce the reader to the detailed ecology of the Dark Peak and the White Peak, the two distinct geographical regions that comprise the Peak District. The final section examines some of the more unusual habitats found in the area.

Although the material is well presented, the authors tend to indulge in value judgements about the changes which are occurring. For example the grassland which has replaced much moorland is described as 'of infinitely less ecological interest'; this statement has little meaning and no explanation of it is offered. In spite of these judgements, which seem to suggest that all change is bad, the text does stimulate the reader to think about changes in the environment and their implications.

There is a very useful glossary of ecological terminology, but the bibliography is not cross-referenced to the research described in the text, which is perhaps a symptom of the authors' dilemma in trying to write a book that would appeal to a wide audience.

This book represents good value for money and is well illustrated with maps, photographs and diagrams.

In the preface, it is suggested that this work will be used like Moss' classic work, *Vegetation of the Peak District*, as a reference point in the monitoring of ecological change in the Peak District. How true this prediction is, only time will tell.

JEPC

Ambridge: an English Village through the Ages by **Jennifer Aldridge** and **John Tregorran**. Pp viii + 150. Borchester Press, in association with Eyre Methuen. 1981. £6.95.

(The Editor is privileged to reprint here the following extracts from a lengthy authoritative review by Mr R. Catchpole, which recently appeared in the *Borchester Echo*. Many readers of *The Naturalist* will be aware of Mr Catchpole's keen commitment to the cause of conservation.)

'. . . Mrs. Aldridge, one of Borsetshire's leading conservationists, and Mr. Tregorran, the noted rural antiquarian, show us the Vale of Am from before the Ice Age down to the present day. Eighteen laborious months of landscape survey and documentary research by the authors and their team of helpers have provided much material and many surprises. The chapters on

Saxon boundaries and on the deserted mediaeval village of Ambridge Superior at Grange Farm are basic to any real understanding of the area's history and organization . . . This reviewer was disappointed that the chapter on local woodlands did not go into greater detail. Enough is said, however, to indicate the need for a much fuller botanical survey (with lichenological slant) of Leader's Wood, the likeliest ancient woodland in the area . . . In the chapter dealing with local dialect a section on Borsetshire usages in Shakespeare will particularly delight older Ambridge inhabitants . . . The book's twenty-six chapters, looking at the history, topography, society, customs, crafts, folklore and superstitions, etc, of the Vale, are interlarded with intriguing photographs (many of them from Mr. D. Archer's private collection), with twelve of Miss C. Bone's sketches and with an array of small Bewick engravings. All in all, the authors have given us an Ambridge recipe as appetising as any they searched out for their closing chapter on local traditional dishes and one which is just as worthy of the rural gourmet's attention.'

Other publications received:

A Guide to the Morphology of the Diatom Frustule by **H. G. Barber** and **E. Y. Haworth**. Pp 112, including 144 figures. Freshwater Biological Association, Scientific Publication No 44. 1981. £3.50. Available from: Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP.

Twenty-five Years On: The D.D.O.S. in Retrospect by **Martin Limbert**. Pp 30. Supplement to *Lapwing* 12, Doncaster and District Ornithological Society. 1980. 70p (including postage) from: Miss E. M. Coleman, 20 Baxter Avenue, Doncaster.

Birds in Huddersfield 1980. Annual Report of the Huddersfield Birdwatchers' Club. Pp 28. £1 (plus 17p postage) from: Mr J. E. Dale, 158 Lindley Moor Road, Huddersfield HD3 3UE.

Ecological Evaluation for Conservation by **Ian F. Spellerberg**. Pp 60. £1.95; **Evolution and Pollution** by **A. D. Bradshaw** and **T. McNeilly**. Pp 76. £2.50. Latest titles in the Institute of Biology's Studies in Biology, published (1981) by Edward Arnold. Paperbacks with numerous line drawings, tables and plates.

Fungal Parasitism by **Brian J. Deverall**. Pp 66. £2.40. 2nd edn; **Plants and Mineral Salts** by **James F. Sutcliffe** and **Dennis A. Baker**. Pp 68. £2.50 2nd edn; **Photosynthesis** by **D. O. Hall** and **K. K. Rao**. Pp 84. £2.75. 3rd edn. Latest revisions (1981) of popular titles in the Institute of Biology's Studies in Biology, published by Edward Arnold. Paperbacks, with numerous line drawings, tables and plates.

Origin of Species. Pp 120, with numerous illustrations in full colour. British Museum (Natural History)/Cambridge University Press. 1981. £12 hardback, £3.95 paperback. A lively and colourful book — companion to the British Museum (Natural History) major centenary exhibition.

Waking Up Dormant Land. Community Uses of Vacant Land and Buildings. Pp 59 with numerous line drawings and plates. 1981. Useful report on the productive uses to which wasteland and vacant buildings can be put. Prepared by the Council for Environmental Conservation Youth Unit in conjunction with Fair Play for Children. £3.40 (including postage) from: CoEnCo, c/o Zoological Gardens, Regent's Park, London NW1 4RY.

Elementary Statistics Tables by **Henry R. Neave**. Pp 48. Allen & Unwin. 1981. £1.50 paperback. A comprehensive collection of statistical tables with notes on usage. Parametric and non-parametric tests are covered together with mathemtical functions such as square roots, factorials and logarithms.

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Edited by M. R. D. SEAWARD, MSc, PhD, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 15p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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BRYOLOGY IN YORKSHIRE PAST AND PRESENT

J. APPLEYARD

Presidential Address to the Yorkshire Naturalists' Union, Middlesbrough, 5 December 1981

It is doubtful whether there are any naturalists who do not know something about flowering plants and ornithologists are the largest section in most natural history societies. Butterflies, moths and to some extent even beetles and spiders have English names but byrophytes are only known by names derived from the Latin or Greek. Bryology, being a little known discipline, poses an additional hazard to the unfortunate individual whose task it is to keep an audience from its post-prandial nap.

In 1960 the British Bryological Society introduced a scheme for mapping the bryophytes of the British Isles taking the 10 km grid square as the unit for recording purposes. This scheme is the same as the one employed by the Botanical Society of the British Isles. Official recording is to finish by the end of 1982, soon after which an Atlas will be published, although recording will continue.

There are 175 ten km grid squares in Yorkshire or 5 per cent of those in the British Isles. Much work remains to be done before Yorkshire can be considered to be even fairly well covered.

In addition to its size the county enjoys great geological and topographical variety, thus providing many different types of habitat for bryophytes. Approximately 700 mosses and 300 hepatics have been found in Britain and of these about 70 per cent of the former and 60 per cent of the latter have been recorded in Yorkshire.

The Yorkshire coast is now very poor in maritime species, but a century ago Richard Barnes was able to find rarities such as *Bryum calophyllum*, *B. warneum*, *B. marratii*, *Amblyodon dealbatus*, *Petalophyllum ralfsii*, and *Moerckia hibernica* in the dune slacks of the Coatham Marshes. Industrialisation completely ruined this area of Teesmouth, and when Y.N.U. bryologists went there in 1973 they found nothing but slag heaps and dumps.

There are old records of *Schistidium maritimum* from Huntcliff near Saltburn and rocks near the Spa, Scarborough but it has not been seen for very many years. *Amblystegium serpens* var. *salinum* was collected near Coatham in 1903 and could still survive somewhere along the coast. *Tortula ruraliformis* was found at Bridlington in 1903 but I have no further knowledge of it there. However, it was found on the sand dunes at Marske in 1973, an addition to VC 62. Long known from Spurn, it was still there in 1974 (Branson, 1975), *Pottia heimii* is not uncommon on muddy ground near the sea.

The next area to consider is the Chalk Wolds of south-east Yorkshire. Although largely given over to agriculture this region has an important contribution to make. *Aloina brevirostris* was recorded from Greenwick Dale, Huggate, in 1967, and *Seligeria calcarea* and *S. paucifolia* were found in a chalk quarry near Huggate. South-east Yorkshire is the most northerly British vice-county for these two little mosses. Another small moss rare in the north which is found on the Yorkshire chalk is *Phascum floerkeanum*.

Next to be considered is the Oolite of north-east Yorkshire, a very pleasant formation both floristically and bryologically and with a wide diversity of species. The most noteworthy discovery on the Oolite was that of Mr Frederick Branson, who found *Seligeria diversifolia* new to Britain, near Wass Bank in 1968. *Herzogiella seligeri* turned up in Tupp Hagg Wood on the occasion of the B.B.S. Northallerton meeting in 1967, thus restoring it to the Yorkshire list and to its most northerly station in Britain.

The Cleveland Hills have their own very special claim to fame. In 1862 William Mudd found *Mielichhoferia elongata* near Ingleby Greenhow, and it was seen there by Barnes in 1910. It seemed to have been overlooked until 1954 when I determined to refind it. From consultation of the map it appeared that the escarpment overlooking Baysdale Moor offered the best chance of success. After exploring gully after gully on the steep slope I was on the point of giving up but decided to try one more gully and there it was — the beautiful pale green cushions lying gleaming on the dark satanic shale. This little moss will only grow where there is a heavy concentration of sulphur in the soil and where it is shaded from direct sunlight. Had I gone a little further, I would have found the *Mielichhoferia* in the next gully, together with *Coscinodon cribosus*, new to Yorkshire, a discovery made on the combined Y.N.U. and B.B.S. visit in 1967.

The only other station for *Mielichhoferia* is in Corrie Kander, in South Aberdeenshire. A bonus to this expedition was the finding of *Tetrodontium repandum* on a rock face in one of the gullies, a species new to Britain.

Another noteworthy find in Cleveland was Mr Blockeel's discovery of *Bartramia ithyphylla*, the first time it has been seen in the vice-county this century.

The carrs and wet heathy commons of the Vale of York have suffered as much as any habitat from the activities of man. The extension of agriculture, drainage and the plantation of conifers have completed the damage. *Paludella squarrosa* and *Helodium blandovii* were once known from such habitats, Cheshire being the only other British county where they have ever been found, but drainage has rendered them extinct there too.

In 1967 the B.B.S. in conjunction with the Y.N.U. visited Pilmoor, which was found to be drying out and invaded by birch and hazel scrub, with the old brick pits badly silted up. However, *Dicranum spurium* and *D. polysetum* were found, the latter new to VC 62 and the former confirming an old record for the vice-county. On the old railway track *Fossombronia incurva* was collected. This hepatic was only discovered in Britain in 1964 and the Pilmoor station was the first in England. Leckby Carr was also visited but was found to be completely overgrown.

Of the thirty species of *Sphagnum* in the British list, twenty have been found in the county as well as the three British varieties. Two of these species are rare by any standard: *Sphagnum balticum* discovered on Thorne Moor by Mr Arnold Thompson in 1932 and happily refound in 1980 and *S. riparium*, also found by Mr Thompson, on Skipwith Common in 1939. The bryological section of the Y.N.U. failed to refind it in 1970 but this is not conclusive evidence of its extinction.

The geology of Yorkshire runs roughly in bands, north and south. The band of Magnesian Limestone extends from the extreme south of the county to a point parallel with Catterick. The most important woodland, bryologically, is Anston Stones Wood, east of Sheffield. In 1978 Y.N.U. bryologists found several species there which were new to south-west Yorkshire, namely *Cololejeunea rosettiana, Scapania aspera*, and *Platydictya jungermannioides*. The most interesting find of all was that of *Marchesinia mackaii*, a considerable eastward extension of range of this rare hepatic. *Amblystegium compactum*, seen there in 1954, was refound.

The introduced moss, *Hyophila stanfordensis*, first detected in Britain on a cliff path in Cornwall, has at least half a dozen stations on the magnesian and another possible introduction, the small hepatic *Lophozia perssonii*, was first collected in the country at Burton Leonard quarry and Jackdaw Crag Quarry. It is also known from the walls of Roche Abbey. Other rare species found on the formation are *Aloina brevirostris* and *Desmatodon cernuus*. In 1955 *Amblystegium compactum* and *Homalothecium nitens* were found in a wet field at Queen Mary's Dubb but by 1964 the *Amblystegium* was gone and only a few stems of *Homalothecium* remained. The only place in the county where it is known to grow now is the bog near Malham Tarn.

To the west of the Magnesian Limestone lie the Coal Measures. Besides being highly polluted they are largely built over and it might be thought that nothing of interest could come from such and unpromising area. Such is far from being the case. In the course of his 10 km species recording Mr Tom Blockeel collected a minute moss, *Barbula tomaculosa*, new to science, in an arable field near Leeds (Blockeel 1981), and he has has since found it in other fields. Also on the Coal Measures the rare aquatic moss *Octodiceras fontanum* grows submerged by the Leeds-Liverpool canal at Armley. Very obligingly it is found on both sides of the canal so that both south-west and mid-west Yorkshire can claim it.

Next to the Coal Measures is the Millstone Grit. When dry and exposed it is, like its name, hard and uncompromising and an unsympathetic nursery for bryophytes. However, given a deep ravine with a stream at the bottom and plenty of sheltering trees it becomes a suitable haven for Atlantic species besides a good selection of more ordinary ones.

It is difficult to imagine today what the most south-westerly corner of Yorkshire was like two centuries ago. We have irrefutable evidence from herbarium specimens and written accounts which we have no reason to doubt that species rare in any part of the county were found in the district. Although no specimen exists it is certain that Gibson collected *Targionia hypophylla* at Hebden Bridge as a description survives which could apply to no other plant.

Over one hundred years ago naturalists of the Calder Valley were lamenting the devastating effects of tree felling, drainage and air pollution by industry. Nevertheless, the Hebden Valley is still a place of considerable bryological interest and fresh discoveries continue to be made there. In 1972 *Fontinalis squamosa* var. *dixonii*, a rare aquatic moss, was discovered in a stream running into Hebden Water. Still more recently *Bazzania trilobata* and *Lepidozia cupressina* were confirmed for south-west Yorkshire and *Isopterygium pulchellum* was refound in the valley after many years. *Bartramia ithyphylla, Cololejeunea calcarea* and *Lejeunea cavifolia* were added to the VC 63 list as well as *Pohlia lutescens* and *P. lescuriana*, two mosses only recognised in the country during the last two decades.

The late Miss Mary Dalby made a detailed survey of Ilkley Moor, part of the vast area known as Rumbalds Moor, overlying the Millstone Grit, and on Denton Moor, north of Ilkley, discovered *Scapania paludicola*, an hepatic new to Britain. Unfortunately its identity was not established until after her death.

Another valley on the grit well known for Atlantic species is Ravensgill, near Pateley Bridge. *Jubula hutchinsiae* was found here almost at the same time as Needham saw it in the Hebden Valley. *Harpanthus scutatus* and *Sphenolobus minutus* are known there and *Isothecium holtii* grows on rocks by the stream, its only Yorkshire station.

It would be heretical to omit any mention of Bolton Abbey Woods from a discussion of Yorkshire bryology. For many years this was the Mecca of the Y.N.U. bryologists — the venue of an annual visit. It is indeed an interesting place as well as providing a pleasant day's outing. *Barbula nicholsonii* and *Fissidens rufulus* are well established there, and *Sphagnum quinquefarium*, which has few authenticated records in the county, has recently been found in the woods.

It might be thought that so well worked a locality could not have anything new to offer but in 1967 *Lejeunea patens* was added, and on rocks near The Strid *Cinclidotus mucronatus* was found, new to Yorkshire. *Fissidens curnovii* was recorded in 1876 but has not been seen since, although diligent search might reveal it.

While on the subject of Bolton Abbey a few words about *Orthodontium gracile* might be appropriate. This moss was first seen in Britain by William Wilson in 1833, in Cheshire. By 1841 it had spread to other counties including Yorkshire, where it was found at Bolton Abbey and several other stations. In 1922 another *Orthodontium* was discovered, again in Cheshire, by Dr Walter Watson of Taunton. For many years it was thought to be a variety of *O. gracile* and was named *O. gracile* var. *heterocarpum*. W. H. Burrell took a great interest in the subject and wrote an article on it (Burrell, 1940). His theory was that var. *heterocarpum* was 'a true-breeding, very fertile, fixed mutation', but this was subsequently found to be erroneous and the plant was identified as *O. lineare*. Over the years *O. gracile* has lost ground in Britain and has apparently become extinct in about half its former stations including Yorkshire, where it was last seen in 1940. Mr Cheetham, in the early 1950s, showed me the rock in Bolton Abbey Woods where it was once abundant but was then a slimy mass of algae. *O. lineare* on the other hand has spread over most of the country: it will grow on almost and substrate and is impervious to moderate levels of pollution.

A type of habitat which until fairly recently has not received the attention it deserves is the margin of reservoirs. At the end of a reasonably dry summer the dry mud exposed by the receding water often reveals interesting species. In 1959 Dr W. A. Sledge found the rare *Physcomitrium sphaericum* by Swinsty Reservoir and *Riccia huebenerana* was found there in 1964. They are also known from Lindley Reservoir together with *Riccia cavernosa, Ephemerum sessile, Weissia rostellata* and *Pohlia bulbifera*. *Physcomitrium sphaericum* has also been found by Dam Flask Reservoir, near Sheffield. A hurried visit to Gouthwaite Reservoir in 1965 yielded *Riccia warnstorfii*, new to VC 64. Probably further search here would prove fruitful.

The Carboniferous Limestone of the western Pennines has long been noted for the rare and interesting species to found there, some of them at or near their southernmost limit, and in spite of tourism and a certain amount of pollution, there have been several important discoveries in recent years.

In 1968 Mrs Paton found *Leiocolea gillmanii* new to England, near Ribblehead Station. In the same year Dr and Mrs Birks found *Schistidium trichodon*, new to Yorkshire, on Ingleborough,

where they also re-discovered *Encalypta alpina*. H. N. Dixon (1924) mentions that it had been seen there but there had been no further record of it this century. In 1966 the Birks found *Jungermannia leiantha* in Twistleton Glen, Ingleton, but it could not be found on a subsequent visit. In 1880 it was found by William West Jnr. in Shipley Glen and there are several records from Eskdale where it has not been seen for many years. I have to confess that on going through my herbarium I found a gathering of mine from Shipley Glen made in 1953 which I had mis-named. Other species new to the county found in the Ingleton Glens during the last fifteen years are *Hypnum callichroum* and *Colura calyptrifolia*.

When Mr A. R. Perry revised the genus *Scapania* he found that a gathering from Thorns Gill near Ribbleshead, identified as *S. subalpina* was *S. praetervisa*, new to Britain (Perry, 1965; Paton, 1981). It has since been recorded from Scotland in three places but Thorns Gill is still the only English station.

Another addition to the Yorkshire list was Dr Francis Rose's find of *Isothecium striatulum* at Gordale in 1955.

The bryoflora of Wensleydale, Yoredale and Swaledale appears to have changed little. The most notable plant known from this part of the country is *Barbula glauca*, found by Barnes on a wall between Richmond and Downeholme and never seen since.

To the west, abutting Westmorland is Dentdale. Although there is a good deal of cold, high ground in Dentdale there are also deep shaded gills suitable for Atlantic species.

Stabler, the Westmorland bryologist, did a lot of work in Dentdale. He attempted to introduce the tender hepatic *Dumortiera hirsuta* into the area, probably in Brackensgill. This reprehensible experiment appears to have failed as the plant has not been seen since.

Two recent visits by Yorkshire bryologists have confirmed many of Stabler's finds. *Orthotrichum stramineum* was restored to the north Yorkshire list and *Bryum elegans* was added to it. *Orthotrichum striatum*, *Plagiochila corniculata* and *Aphanolejeunea microscopica* were county records.

Targionia hypophylla remained without question as a Dentdale plant, said to have occurred between Dent station and the marble works where it was searched for by many bryologists. Subsequent examination of the specimen revealed that it was actually a lichen!

Another odd story concerns *Aulacomnium turgidum*. In 1878 Lees and West ascended Whernside, and collected a plant which they sent to Mr Boswell, who identified it as *Aulacomnium turgidum*. Although Lees and West declared their intention of returning to Whernside to collect more of it they never did so. It has been looked for several times since, without success. Another peculiar feature is that Lees and West said that they found it among *Sphagnum* which is quite the wrong habitat for this moss.

The late Mr George Shaw was very interested in the handsome moss *Ptilium crista-castrensis*. This species was at one time recorded from many localities in Yorkshire but has been dying out over the years. Dr Bedford found it on Baugh Fell in 1932 and after much searching Mr Shaw found it in Hebblethwaite Gill in 1949 and again in 1961.

Teesdale is divided from Durham by the River Tees and contains many of Yorkshire's most exciting species. In 1959 *Tortula virescens* was found, new to England, on trees near Eggleston Abbey. Barnes is recorded as having found *Orthotrichum obtusifolium* in the same place in the 1890s. Interestingly, these two species also grow in close proximity at Inverquharity Castle near Kirriemuir.

Numerous species recorded in Teesdale by Spruce have not been seen since. Several of them were *Dicranum* species and other plants of a montane type, which may have been misnamed. Nevertheless, it might repay a small party of bryologists to camp out for a few days on the high fells of Teesdale such as Greenfell where some of these old records might be confirmed.

Many additions to the Yorkshire bryoflora have recently been made in Teesdale, namely *Lophozia obtusa*, *Barbilophozia hatcheri*, *Leiocolea heterocolpos* (new to England), *Jungermannia confertissima*, *Philonotis tomentella*, and *Schistidium agazzisii*.

I would like to say a little about former Yorkshire bryologists whom I knew personally. Harold Walsh might be cited as the last of the working-men naturalists of the Calder Valley. He did not attend many of the Y.N.U. meetings, at least when I knew him. His main interest was in the bryophytes of Halifax Parish. He found many stations for the rare *Jungermannia caespiticia*.

A quiet man but helpful and enthusiastic in the field, he showed me *Moerckia hibernica* on Ogden Moor and guided me around the Hebden Valley. Walsh's most curious find was a single capsule of *Buxbaumia aphylla* on a wall at Hebden Bridge.

I attended several Y.N.U. meetings at which Arnold Thompson was present. He was another quiet but helpful man, always very neatly dressed. He made little concession to a day in the field — indeed he would have been quite acceptable at a board meeting except for the necessity of a pair of stout boots.

Christopher Arthington Cheetham was famous throughout Yorkshire as an all-round naturalist. I made several visits to Austwick where he had his cottage. We went on many excursions together to his favourite haunts and it was Chris Cheetham who guided my very faltering steps along the path of bryology. Here again the sartorial aspect is strong. He nearly always wore shorts, said to be the result of cutting down the trousers of a normal suit which he was forced to assume on such occasions as weddings and funerals. He always wore a jacket, not an anorak, and a beret. His needs for the day — a waterproof cape if rain threatened, food and a spirit stove on which to brew coffee — were carried in a D.I.Y. rucksack made from a piece of waterproof material and a piece of stout string. He was the least malicious of men but he did like to tell the tale of how men from the city would ask him to take them out and he would walk them off their feet.

I knew George Shaw from the time I joined the Y.N.U., and Mary Dalby. Their deaths were a great loss to the Union and to me and many others as friends of long standing.

Bryology in Britain is flourishing; segregates are being formed from what were thought to be a single species, plants new to science are discovered, plants thought to be extinct are refound, introductions turn up as well as truly native species new to Britain.

In all this excitement Yorkshire is holding her own. There is little doubt that the future will disclose further interesting additions to the bryoflora of the county. The Union has a splendid tradition of bryologists of exceptionally high calibre. It is to be hoped that this tradition will never be allowed to die.

I would like to conclude by saying how highly I value the honour you have done me in electing me as your President. It is an honour to which I never hoped to aspire so that my nomination came as a bolt from the blue. To my mind my only qualifications for joining the list of eminent people who have preceded me as Y.N.U. presidents appear to be membership for thirty-five years and unfailing interest in the work of the Union, particularly — dare I say it — the Bryological Section.

The nomenclature follows that of Corley and Hill (1981).

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BOOK REVIEWS

Sea Guide to Whales of the World by **Lyell Watson**. Pp 302, with many colour illustrations. Hutchinson. 1982. £12.95.
I have scanned several good books on whales in the past few months, and this is by far the best. Lyell Watson is an unusual biologist — one who writes clearly, precisely and readably, however technical his subject matter. His long-term association with the cruise-ship *Lindblad Explorer* has given him unusual opportunities to see whales, dolphins and porpoises at sea, and he has done his homework well in the libraries and museums. The result is a superb text — a 'celebration of cetaceans', the author calls it — which is at the same time informative and accurate. It has all the elements of a field guide plus a deal of background information on anatomy, physiology, evolution, ecology and distribution of cetaceans. Tom Ritchie's illustrations include portraits of all species and many imaginative diagrams of whales in action. Books designed by packagers for hawking to publishers have got themselves a bad reputation, often rightly so. Seeking attention in a highly competitive market, they tend to be eye-catching and trivial. This is an honorable exception — a well designed, well illustrated book, put together with care and intelligence. I am glad to have it on my shelves and I strongly recommend it to anyone who wants to know about whales.

BS

The Flight of the Condor: a wildlife exploration of the Andes by **Michael Andrews**. Pp. 158, with many photographs in colour and black and white. Collins and British Broadcasting Corporation. 1982. £12.95.
Michael Andrews is a photographer and writer who has produced many successful *Horizon* and *World About Us* television programmes for the BBC. This book covers his recent South American series, *The Flight of the Condor*. Those who enjoyed the series and want to know more about the flora and fauna of the Andes may welcome this book, which tells many of the stories behind the filming and gives us a chance to see some of the excellent photographs again. Those who know nothing of the series have a treat in store. This is a well-written book in its own right — an interesting, off-beat account of wildlife in the Andes from Tierra del Fuego to the Amazon forests — a huge area that few naturalists have had a chance to explore. The photographs have put the price up, but are well worth it.

BS

Blandford Mini-Guides. Series Editor: **Alison Copland**. Pp. 128 each. Blandford Press. 1981. 95p each (soft cover).
Six pocket-sized books, each only 4″ × 3″, dealing with Birds, Butterflies, Fish, Rocks and Minerals, Berries, and Mushrooms and Toadstools, seem a good idea. A full page illustration of a species with a page of accompanying text should aid identification, but their poor quality, particularly in the 'Rocks and Minerals', and in some cases inaccurate illustrations and text, make these very poor guides, however easy to carry. The text suffers from having been apparently re-written from the original Swedish or Norwegian (e.g. for Zinc Blende 'its lustre is not always that great.') and the species selected for inclusion are more relevant to Scandinavia than Britain. Waxwing, Black Woodpecker, Velvet Scoter and White Wagtail are hardly species to merit inclusion in a beginner's book of only 60 'British' birds; and 15 of the Butterflies do not occur in Britain whilst 12 British species are not represented.

The idea of the Mini-guide is good, but in this case the content, for both choice of species and accuracy, makes them hardly worth carrying. The Collins Gem Guides are just as easy to pocket, and though more expensive are much better value, in accuracy, quality of illustrations, and species selection.

Gem Guide to Butterflies and Moths by **Michael Chinery**, with illustrations by **Brian Hargreaves**. Pp. 240. Collins. 1981. £1.75.
A really good pocket-sized book illustrating nearly 400 species in colour with details of food plants and caterpillars. The selection of species is good, and it is a reliable and attractive book; to be commended for the interested, adult amateur.

THE DENSITY OF BREEDING MAGPIES *PICA PICA* L. IN AN URBAN ENVIRONMENT

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Introduction

Although the magpie *Pica pica* L. is known to be present in a number of British cities (Simms, 1975; Sharrock, 1976), very little has been published on its distribution and density in these areas.

Between 1976 and 1979 a detailed study of urban magpies was undertaken in south Manchester, during which nesting density, breeding biology and feeding ecology were investigated (Tatner, 1980). This paper concerns the nesting density and the problems of censusing magpies in the urban environment

Methods

The study covered an area of 42 km^2 in south Manchester, which amounts to 4.8 per cent of the Manchester conurbation (Fig 1). The area encompasses a range of urban habitat, from the high density housing of Old Trafford, Hulme, Moss Side, Longsight, and West Gorton, where a few parks, recreation grounds, and 'cleared' areas provide the only concessions to a 'natural' environment, through to Barlow Moor, Didsbury and Heaton Mersey which lie along the River Mersey floodplain, and where golf courses, sports grounds, a cemetery, and large gardens support a much greater diversity of flora and fauna.

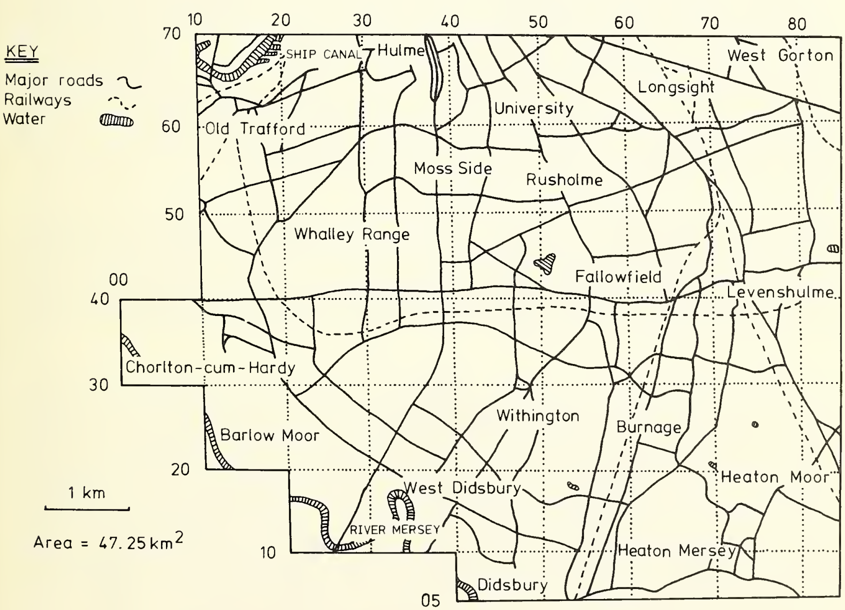

FIGURE 1
Map of the study area.

In order to survey the area efficiently, a planned guide was constructed prior to the fieldwork, using a street map (Geographers A/Z Map Co). This involved plotting a route on all the relevant pages of the A/Z, such that every other road formed part of the route, and where possible no road was traversed more than once. The fieldwork was undertaken by following the route on a bicycle.

Between 1977 and 1979, four surveys were undertaken. A spring survey was carried out in each year, during which both magpies and their nests were recorded. The remaining survey took place during the summer of 1977, and was solely concerned with the number of magpies present. All nest sites were marked on the route map, and a note was made of whether the nest was active or disused. The nest surveys were carried out during the early spring because nests can be seen easily only when there is a lack of foliage. In addition, magpies tend to be more conspicuous at this time of the year, because they begin nest-building and sitting 'sentinel', ie advertising their occupation of a territory by perching on a high prominence.

One of the problems with a single visit survey is the difficulty one has in deciding whether or not a particular nest is in use (ie active), especially since the durability of magpie nests often results in there being a number of apparently complete nests in each territory. This problem can be largely overcome by undertaking a spring census, since nests with magpies in close attendance, or those where the bird is actually building, are obviously in use. In other cases it is reasonable to assume that all complete nests are in use, except when they occur in close proximity, such as in the same or neighbouring trees. Magpies are strongly despotic and are therefore unlikely to nest in close association. These assumptions may have resulted in a slight over-estimate of the number of nests in use, but this is not thought to be serious error as it offsets active nests that were mistakenly identified as disused (ie those that were only partly constructed and had no magpies in attendance).

The aim of the second survey was to obtain an estimate of the fledging success during 1977. The problem of poor visability due to dense foliage during the summer was partly counteracted by attracting magpies, using a tape recording of their calls. This was played at occupied nest sites in order to bring the adults and newly fledged young into the open. Individual magpies were classed as adult or fledgling according to whether they possessed a long tail; fledglings have short tails. This criterion may involve a small error, since Seel (1976) found that 11 per cent of the adults in his sample (n = 35) taken during the second half of June, were commencing rectrix moult. These birds were presumably failed or non-breeders, as the majority of adults moult their rectrices between the middle of July and November (Seel, 1976).

Results

The results of the four surveys are given as a series of matrices in Fig 2, which correspond to the grid shown on the study area map (Fig 1). The survey area is comprised of forty-two units, each of 1 km^2. To facilitate interpretation and discussion of the results, average figures for the number of nests and the number of breeding magpies on each survey were calculated (Tables 1 and 2 respectively).

TABLE 1

Average number of magpie nests per square kilometre in part of south Manchester, between 1977 and 1979

Survey	Year	Number of squares	Total nests x	Total nests SD	Active nests x	Active nests SD	Disused nests x	Disused nests SD
1	1977	42	13.6	7.3	5.8	3.0	7.8	5.0
3	1978	42	15.1	8.3	6.9	4.3	8.2	4.8
4	1979	42	16.4	9.1	*9.0	4.6	5.5	4.2
					†2.0	1.8		

* This figure represents nests that were believed to have been in use during 1978.

† This figure represents newly-constructed nests in 1979.

Nest Density

The average density of magpie nests in the area ranged between 13.6 per km^2 in 1977 and 16.4 in 1979 (Table 1). These figures are not estimates of the breeding density because they include a proportion of disused nests. The average density figures (Table 1) show that only 43 per cent of the total magpie nests censused in 1977, 46 per cent of those in 1978 were active; thus more than half the magpie nests present were disused. The average number of active nests provide better estimates of the breeding density. In 1977 there was an average of 5.8 active nests per km^2, and 6.9 in 1978 (Table 1).

The ratio of disused to active nests was calculated for every square. On the spring survey in 1977 there was an average of 1.40 disused to every active nest. The corresponding figure of 1.45 for 1978 was not significantly different ($t = -0.37$, $P = 0.71$, NS).

During the fourth survey, nests were not recorded as being either active or disused; instead three categories were recognized: those thought to have been in use during 1978, those newly constructed for the 1979 breeding season, and those which were disused in 1978 (Fig 2).

TABLE 2

Average number of magpies per square kilometre in part of south Manchester

Survey	Year	Number of squares		Number of magpies $\bar{x}$	SD
1	1977	42	Adults	7.5	5.1
2	1977	42	Adults	5.4	3.8
			Young	4.4	4.4
3	1978	42	Adults	10.2	7.5
4	1979	42	Adults	9.1	7.3

Magpie Density

In 1977, the average breeding magpie density in the area was 7.5 birds/km^2 on the spring survey and 5.4 birds/km^2 on the summer survey (Table 2). The lower density on the summer survey was almost certainly due to reduced visability caused by dense foliage. On the spring surveys of 1978 and 1979 the average densities of breeding magpies were 10.2 birds/km^2 and 9.1 birds/km^2 respectively. During the calculations for average number of breeding magpies, all groups (ie feeding, roosting, and gatherings; see Fig 2) were excluded. In a territorially despotic species such as the magpie it is reasonable to assume that breeding birds remain on their territory during the spring. Large groups of magpies seen on some of the spring surveys are therefore presumed to be non-breeding birds, hence their exclusion from this category.

Discussion

Nest Density

There was a significant increase in the average number of active nests between 1977 and 1978 ($t = 2.71$, $P = 0.01$). This is unlikely to have been due to an improvement in the census technique, since there was no significant increase in the average number of disused nests per square ($t = 1.12$, $P = 0.27$). Besides which, the 19 per cent increase in the average number of active nests per square is corroborated by a 36 per cent increase in the average number of magpies recorded per square over the same period. The 1977 breeding season was probably a good season for magpies throughout Britain, because the Common Bird Census results indicate that an 8 per cent increase occurred on both 'Woodland' and Farmland plots (Marchant and Hyde, 1980a).

The average number of active nests in 1978 was estimated on the third survey to be 6.9 nests/km^2, but retrospectively on the fourth survey as 9.0 nests/km^2. Although completion of the third survey before late-breeding magpies had begun building their nests would produce an

FIRST SURVEY
1977
DISUSED NESTS = 326
ACTIVE NESTS = 244
TOTAL NESTS = 570

THIRD SURVEY
1978
DISUSED NESTS = 346
ACTIVE NESTS = 290
TOTAL NESTS = 636

Pre-1977 Disused	1977 Active
Pre-1978 Disused	1978 Active

	1 1 / 3 2	4 6 / 4 4	0 2 / 2 3	3 2 / 3 1	0 3 / 2 1	1 1 / 0 1	8 6 / 10 5
	9 5 / 6 3	3 3 / 4 5	1 3 / 3 2	3 4 / 7 2	7 6 / 10 6	3 7 / 4 4	6 2 / 7 6
	1 3 / 3 4	6 4 / 6 6	12 7 / 9 10	9 6 / 5 7	15 13 / 17 19	13 9 / 12 8	11 5 / 13 9
12 2 / 7 1	8 6 / 9 8	17 8 / 15 9	4 4 / 4 3	2 5 / 3 8	7 5 / 10 5	8 8 / 14 6	15 7 / 12 10
	9 8 / 11 9	15 9 / 16 17	18 7 / 14 9	3 8 / 5 11	13 8 / 13 10	8 10 / 11 10	11 9 / 15 7
		6 5 / 5 8	9 6 / 12 9	13 13 / 19 11	13 10 / 8 18	10 5 / 7 7	9 3 / 6 6

FOURTH SURVEY
1979
DISUSED NESTS = 229
1978 NESTS = 376
1979 NESTS = 82
TOTAL NESTS = 687

Pre - 1978	1978
1979	

	0 4 / 0	4 8 / 0	0 2 / 2	3 2 / 0	1 2 / 0	1 2 / 1	6 11 / 0
	5 5 / 1	0 5 / 2	1 4 / 1	6 3 / 1	5 11 / 3	3 6 / 0	3 9 / 2
	2 6 / 2	1 8 / 1	4 12 / 1	1 10 / 2	16 19 / 1	9 9 / 2	3 10 / 1
3 2 / 1	4 8 / 3	13 10 / 3	3 4 / 3	2 7 / 0	12 10 / 1	10 8 / 1	8 11 / 2
	8 14 / 4	12 13 / 4	11 11 / 6	7 15 / 1	7 11 / 1	4 15 / 1	11 12 / 3
		2 9 / 0	11 15 / 5	10 16 / 5	10 19 / 8	4 9 / 4	3 9 / 3

FIRST SURVEY
1977 SPRING
TOTAL MAGPIES = 316

SECOND SURVEY
1977 SUMMER
ADULT MAGPIES = 227
FLEDGLING MAGPIES = 186
ADULT : FLEDGLING 1:0.82

Grid axes: 10 20 30 40 50 60 70 (horizontal); 70 60 50 40 30 20 10 (vertical)

	4	6	0	0	2	2	10
	2/0 2	2/3 5	0/0 0	4/0 4	2/2 4	2/0 2	12/3 15
	15	7	7	9	9	3	7
	5/0 5	1/3 4	5/5 10	1/2 3	2/2 4	3/2 5	3/3 6
	0	7	17	17	23	6	11
	2/3 5	7/1 8	13/9 22	6/3 9	9/8 17	2/9 11	0/1 1
2	9	10	9	5	12	3	14
0/3 3	5/3 8	14/17 31	7/8 15	4/0 4	4/3 7	8/2 10	7/1 8
	5	14	7	4	7	11	10
	8/9 17	5/11 16	6/9 15	1/0 1	9/8 17	13/18 31	8/5 13
		2	6	7	3	10	4
		6/6 12	10/3 13	5/6 11	9/12 21	5/3 8	10/2 12

1st. SURVEY TOTAL
Adults / Fledglings } 2nd. SURVEY TOTAL

THIRD SURVEY
1978
TOTAL MAGPIES = 457

FOURTH SURVEY
1979
TOTAL MAGPIES = 416

	0	3	0	3	6	0	12
	0	1	0	4	3	2	10+20R
	9	2	4	3	7	6	11
	9	1+8G	2	6	8	12	8
	3	20	10	11	24+16F	3	11
	7	6	15	7	35	0	3
6	6+8G	15+6F	4+26G	9	11	15	11
0	4	17	4	12	8	14	8
	22+12F	38	14	8	18	13+8G	7+16G
	14+20F	14	21	5	17+7G	15	18+7F
		12	15	14	19	11+14F	14
		5	22	12	16	11+6F	7

3rd. SURVEY TOTAL
4th. SURVEY TOTAL

R : Roost
G : Gathering
F : Feeding

FIGURE 2
Numbers of magpies and their nests recorded in the study area on four surveys carried out between 1977 and 1979.

underestimate for the number of active nests in 1978, this is unlikely to account for the difference between surveys because the magpie numbers in each square during 1978 were correlated more closely with the corresponding numbers of active nests on the third survey ($r^2 = 0.589$),* than with the numbers of '1978' nests found retrospectively on the fourth survey ($r^2 = 0.467$).* Instead, it is thought that the fourth survey figure of 9.0 active nests/km^2 is an overestimate, because a pair of magpies will often build replacement nests if their breeding attempt fails. A study of the breeding biology in the area revealed that 36 per cent of the pairs present undertake a repeat breeding attempt, and 76 per cent of these either newly construct, or renovate another nest (Tatner, in press). Hence there should be a 27 per cent increase in the number of active nests over the breeding season due to the construction of replacement nests. So the average density of active nests found on the third survey can be expected to increase from 6.9 to 8.8 by the fourth survey, which is reasonably close to the observed value of 9.0. Thus the numbers of active nests on a spring survey provide the closest representation of actual breeding density for the forthcoming season.

Renovation of old nests

Since the number of magpies censused per square dropped between 1978 and 1979 by 11 per cent, it is reasonable to assume that the average number of active nests would have declined by half this amount, from 6.9 to 6.5 nests/km^2, had this category been recorded during 1979. There was an average of only 2.0 newly constructed nests per square on the fourth survey (Table 1), much lower than the expected figure of 6.5 active nests. The similarity in average number of total nests for the years 1978 and 1979 (Table 1) indicates that nest building was probably no later than usual in 1979, and it therefore seems likely that a large proportion of magpies were renovating old nests for the breeding attempt. If this were true it would mean that 69 per cent (ie $100 \times 4.5/6.5$) of the active nests in 1979 were renovated old nests. In the breeding biology investigation (Tatner, 1980), where the construction history was known for 126 nests, forty-nine (ie 39 per cent) breeding attempts occurred in renovated nests. Although this figure is much lower than that estimated from the nest survey it does support the contention that a proportion of magpies renovate nests. This practice will be advantageous if it reduces the amount of time and energy spent on nest construction. Magpies adopting this strategy might therefore rapidly accumulate sufficient reserves for egg formation, and hence begin breeding earlier in the season. A number of factors are likely to be involved in determining whether a pair builds a new nest or renovates an old one, including: the availability of nesting material; the number of old nests in the territory and their condition; whether the previous breeding attempt in the nest was successful; whether the magpie pair has survived from the previous year in their own territory or are prepared to renovate nests built by conspecifics; and whether it is an initial or repeat breeding attempt. The combination of these and other unrecognized factors is likely to produce a high degree of variability in the proportion of renovated nests in a given year. Goodwin (1976) notes that magpies rarely renovate old nests for the breeding attempt, although new nests may be built on top of old ones giving the false impression that renovation has taken place. In a study of the American magpie *P.p.hudsonia*, Erpino (1968) found eleven renovated nests in a sample of ninety-one breeding attempts. The habit of renovating nests in Manchester may be an adaptation to the urban environment, as it is so widespread. The high breeding density and the possibility of intraspecific competition may have provided a selection pressure for early breeding, an aspect which the habit of renovating nests would facilitate.

Relative efficiency of nest and bird censuses

Fig 3 shows the relationship between the number of active nests and the number of magpies seen, for each square kilometre, during 1977 and 1978. The number of adult magpies seen on the spring and summer surveys during 1977 are shown together so that it is possible to consider the effectiveness of the tape-recording method. If all the breeding magpies present were located, there should have been twice as many magpies as there were active nests; as Fig 3 shows, this did not occur. The coefficients of determination for the relationship between number of active nests and the number of magpies seen in each square (Table 3), indicate that the correlation was best

* r^2 is the coefficient of determination, $n = 42$, $P = 0.001$ for both correlations.

on the third survey (Fig 2). The proportion of the magpie population sampled on each survey can be calculated by halving the number of magpies seen and dividing this figure by the number of active nests (Table 4). On a spring census, when there was no foliage to obscure observations, between 72 and 84 per cent of the magpies present were seen. However, these are average figures and, as the standard deviations indicate, there was a large variation in sampling intensity between squares. The lower average sampling intensity on the second survey (57 per cent) indicates that the use of a tape-recording to attract magpies only partly compensates for reduced visibility.

Significance of magpie gatherings

Large groups of magpies were seen feeding, roosting and at gatherings on the third and fourth surveys (Fig 2). These large groups were excluded from the calculations because they were thought to be flocks of free-ranging, non-breeding birds, similar to those reported for the carrion crow *Corvus corone* (Charles, 1972). My own observations suggest that groups of magpies move around the breeding area during early spring, probably in search of food and vacant breeding territories. When a group converges on a nest site this usually results in a gathering, similar to those reported by Stubbs (1910); gatherings are initiated by non-breeding birds (Birkhead, 1979). Extremely aggressive interactions may develop, and on one occasion it was possible to

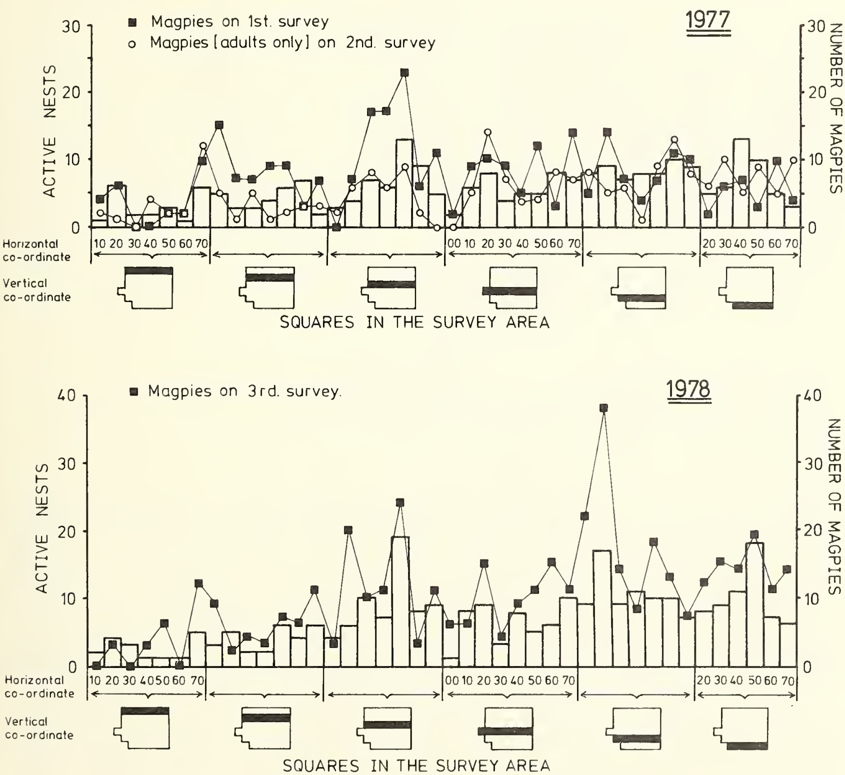

FIGURE 3

Relationship between the number of active nests and the number of magpies recorded in each square kilometre, for three surveys in 1977 and 1978.

TABLE 3

Correlations between the number of active nests and the number of magpies seen in corresponding squares

	Pearson Correlation Coefficient (r)	r^2	P
Active nests on the first survey and Number of magpies on the first survey	0.4649	0.2161	0.002
Active nests on the first survey and Number of adult magpies on the second survey	0.4832	0.2335	0.001
Active nests on the third survey and Number of magpies on the third survey	0.7677	0.5894	0.001

TABLE 4

Average sampling intensities on the first three surveys. Averages taken over the forty-two complete kilometre squares in the survey area

	Average	SD	n
First survey: $\sum_{1}^{42} \frac{0.5 \times (\text{No. of magpies per square on first survey})}{\text{No. of active nests per square on first survey}} \Big/ n$	0.72	0.49	42
Second survey: $\sum_{1}^{42} \frac{0.5 \times (\text{No. of adult magpies per square on second survey})}{\text{No. of active nests per square on first survey}} \Big/ n$	0.57	0.36	42
Third survey: $\sum_{1}^{42} \frac{0.5 \times (\text{No. of magpies per square on third survey})}{\text{No. of active nests per square on third survey}} \Big/ n$	0.84	0.63	42

capture a combatant by hand because a number of its remiges had been severely damaged; it was a first-year bird and probably female. A great deal of calling and chasing occurred at gatherings in the study area, which I believe is the result of resident birds attempting to drive the flock out of their territory. It is possible that gathering behaviour represents some sort of selection procedure during which a pair from the non-breeding flock establish their right to take over a territory. This would explain why a gathering occurs soon after a territory-holding bird is shot (Raspail, 1901; Goodwin, 1976). It would also indicate why magpies are able to replace a dead mate very rapidly (Minton, 1958; Shannon, 1958), although in these cases it is more likely that the bereaved individual is usurped by a non-breeding pair. A study of marked individuals has shown that if a magpie loses its mate, the territory is usually taken over by a new pair (Högstedt, 1980). Baeyen's (1979) observations of a marked population have shown that both paired and unpaired birds participate at gatherings and she concluded that they represented trials for territory establishment in most cases, but did not rule out the possibility of a role in the establishment of the pair bond.

In this study no gatherings were recorded on the first and second surveys, but four gatherings involving fifty-eight birds occurred on the third survey, and two gatherings involving fifteen birds

were seen on the second survey (Fig 2). Gatherings occur during the late winter and early spring (Goodwin, 1976), hence their absence on the second (summer) survey. On the remaining surveys there appears to be an inverse relationship between the abundance of breeding magpies (Tables 1 and 2) and the number of gatherings. Gatherings are more likely to occur when there is a large surplus of non-breeding birds, a feature which ties in well with their suggested function.

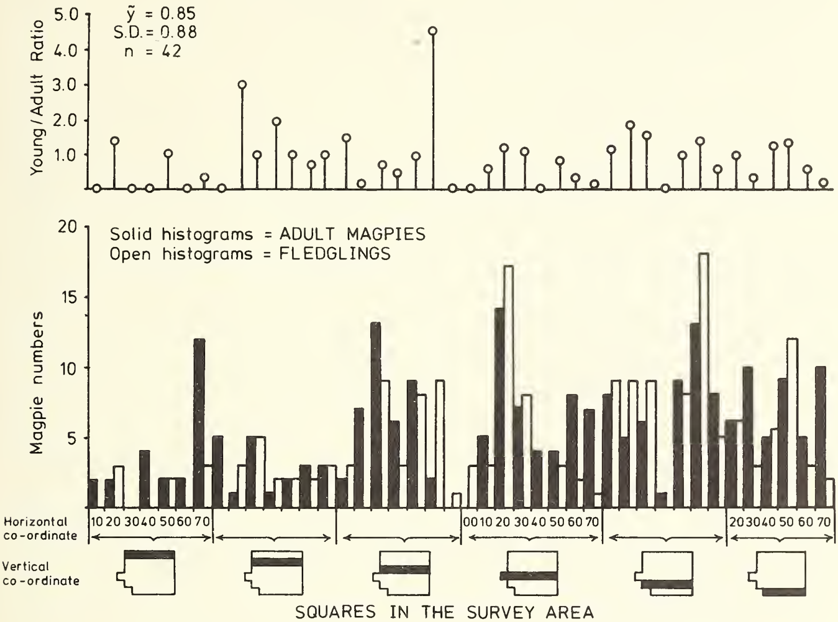

FIGURE 4
Relationship between the numbers of adult and fledgling magpies seen in each square kilometre on the 2nd survey (summer 1977).

Breeding success — the young:adult ratios

The numbers of adult and fledgling magpies seen in each square on the second survey are represented graphically by Fig 4, which also shows the young:adult ratios for each square. The average young:adult ratio for the whole area was 0.85:1. This may be interpreted as a fledging success of 1.7 young per pair, on the assumption that all adult magpies seen were breeding birds, and that the sampling intensity was the same for adult and fledgling birds. Although the number of fledglings increased towards the south (bottom) of the survey area (ie as one moves further from the city centre), this was largely related to a corresponding increase in the number of adult magpies; young:adult ratios were relatively constant. Thus the breeding success seems to have been similar throughout the area, even though nesting density increases as one moves further from the city centre (see Fig 3).

Magpie breeding density in urban and rural areas

In 1946 the density of magpies breeding in Sheffield was 1.3 pairs/km^2 (Carr, 1960), thirty years later this had risen by 215 per cent to 4.1 pairs/km^2 (Roberts, 1977). There are no comparable figures to indicate how the situation changed in Manchester over the same period, but the

TABLE 5

Magpie density on Farmland and Woodland areas in Britain, from 1962 to 1979

Figures calculated from Common Bird Census returns (after Bailey, 1967, 1968; Bailey and Batten, 1968; Batten, 1969, 1971a, 1971b, 1972, 1973; Batten and Marchant, 1975, 1976, 1977a, 1977b; Marchant, 1978; Marchant and Hyde, 1980a, 1980b).

FARMLAND					WOODLAND				
Year	Area censused (km^2)	Magpie pairs	Density pairs/km^2	Average density pairs/km^2	Year	Area censused (km^2)	Magpie pairs	Density pairs/km^2	Average density pairs/km^2
1962	38.70	32	0.83	0.83					
1963	38.70	41	1.06	1.04					
	69.00	70	1.02						
1964	69.00	82	1.19	1.27					
	74.70	100	1.34						
1965	74.70	112	1.50	1.53					
	80.30	125	1.56		1965	17.70	37	2.09	2.09
1966	80.30	142	1.77	1.78	1966	17.70	44	2.49	2.75
	70.42	125	1.78			13.30	40	3.01	
1967	70.42	113	1.61	1.76	1967	13.30	50	3.76	3.66
	65.70	125	1.90			13.54	48	3.55	
1968	65.70	128	1.95	1.96	1968	13.54	37	2.73	2.62
	67.64	133	1.97			14.40	36	2.50	
1969	67.64	138	2.04	2.15	1969	14.40	45	3.13	3.66
	66.48	150	2.26			12.68	53	4.18	
1970	66.48	146	2.20	2.25	1970	12.68	45	3.55	3.58
	67.92	170	2.50			14.13	51	3.61	
1971	67.92	155	2.28	2.27	1971	14.13	50	3.54	3.26
	64.48	146	2.26			16.43	49	2.98	
1972	64.48	155	2.40	2.39	1972	16.43	56	3.41	3.09
	61.54	143	2.32			15.91	44	2.77	
1973	61.54	149	2.42	2.49	1973	15.91	53	3.33	3.87
	56.18	144	2.56			16.57	73	4.41	
1974	56.18	152	2.71	2.83	1974	16.57	90	5.43	5.26
	60.86	179	2.94			18.28	93	5.09	
1975	60.86	174	2.86	2.88	1975	18.28	108	5.91	5.92
	63.49	184	2.90			19.25	114	5.92	
1976	63.49	202	3.18	3.38	1976	19.25	106	5.51	5.40
	58.42	209	3.58			21.21	112	5.28	
1977	58.42	215	3.68	3.58	1977	21.21	127	5.99	6.25
	68.03	237	3.48			21.69	141	6.50	
1978	68.03	256	3.76	3.61	1978	21.69	152	7.01	6.81
	61.95	214	3.45			23.46	155	6.61	
1979	61.95	207	3.34	3.34	1979	23.46	174	7.42	7.42

present survey indicates that the breeding density is higher than the 1960 figure for Sheffield. However, the variation in nesting density between the squares in Sheffield and Manchester is similar (cf standard deviation of mean nesting density; Sheffield, 3.1; Manchester, 3.0 in 1977 and 4.3 in 1978).

How does the breeding density of magpies in towns compare with that in rural areas? Although there are no published figures dealing specifically with the breeding density of magpies in rural areas, figures can be obtained from Common Bird Census returns (Table 5). Between 1966 and 1979 the density on Farmland plots increased by 88 per cent (ie 1.78 to 3.34 pairs/km^2, Table 5), and on 'Woodland' plots by 170 per cent (ie 2.75 to 7.42 pairs/km^2). Contrasting these figures with changes indicated by the CBC indices shows that the increased density on Farmland is largely due to the recruitment of 'magpie rich' plots (see Appendix). The greater abundance of magpies on 'Woodland' plots does not reflect a preference for forest habitat, as this category is an amalgam of habitats: 14 per cent woodland; 45 per cent parkland; 27 per cent heath and scrub; and 14 per cent miscellaneous (after Marchant, 1978). It should also be realized that the average 'Woodland' plot size is only 0.2 km^2, which means that small recording biases will be greatly magnified in the final density figures. Assuming there are no recording biases, the average density of magpies on 'Woodland' plots is similar to that in the urban environment of Manchester (ie 6–7 pairs/km^2). The relatively low density of magpies on Farmland plots (3.34 pairs/km^2) may be due to a paucity of suitable nest sites, although competition with other Corvid species may also be a significant factor. In the 1973–74 review of bird population changes, Batten and Marchant (1976) suggested that magpies had saturated their primary farmland habitat, and were consequently expanding into secondary habitats. The magpie's adaptability and an increase in its numbers following the reduction of persecution by game-keepers during and after the two world wars (Sharrock, 1976) were probably the main reasons for the general expansion of magpies in Britain that began during the 1940s, and which is apparently still in progress. The most notable instance of this has been its move into the urban environment, so that it now occurs at a higher density in Manchester than in the farmland areas from which it originated.

Summary

This paper describes an investigation of magpie breeding density, undertaken between 1977 and 1979, in 4.8 per cent of the Manchester conurbation. The total number of magpie nests per square kilometre does not provide a good indication of the breeding density because the robust nature of the nests results in a high proportion of disused nests being present (54–57 per cent). Average breeding density was estimated from surveys of active nests, as 5.8 pairs/km^2 in 1977 and 6.9 pairs/km^2 in 1978.

In Manchester, a high proportion of magpies renovate an old nest for the breeding attempt, a habit which may be associated with their move into the urban area. Recording the number of magpies seen on spring surveys indicated average sampling intensities of 72 and 84 per cent, although there was a high degree of variability between grid squares. Magpie gatherings occurred in the area on five occasions, and their significance was discussed. During the summer of 1977, magpies in the area were estimated to have fledged 1.7 young per pair.

A comparison of urban and rural areas indicated that magpies now breed at a higher density in Manchester and Sheffield than on farmland.

Acknowledgements

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Appendix

In 1979 the Common Bird Census Index for magpies on Farmland was 113, and on 'Woodland' it was 262 (Marchant and Hyde, 1980b). Therefore the increases between 1966 and 1979 indicated by the CBC indices are: 13 per cent for Farmland plots, and 162 per cent for 'Woodland' plots (CBC index = 100 in 1966). The CBC index shows a much smaller increase in magpie numbers on Farmland than is indicated by the density figures (ie 13 per cent cf 88 per cent). Both methods only use data from areas common to consecutive years, and the trends between years are similar, which implies that the difference is caused by a loss of 'magpie poor' plots and an increase in 'magpie rich' plots. This is indicated by the 'within year' changes in magpie density on Farmland (Table 5), as there are only five instances of a decrease in density due to the addition of new areas, while there are eleven increases. It is therefore important to note gradual shifts in the character of the CBC plots when interpreting changes in density figures.

NOTES ON YORKSHIRE MOLLUSCA — 5
FERRISIA WAUTIERI (MIROLLI 1960) A FRESHWATER LIMPET, NEW TO YORKSHIRE

A. NORRIS

Leeds City Museum

On 3 October, 1981, during a joint meeting of the Yorkshire Conchological Society and the Halifax Scientific Society, a small limpet was found attached to water weeds in the Calder and Hebble Navigation Canal at Ganny Lock, between Brighouse and Elland (V.C. 63), SE 44/136230.

The limpet proved to be *Ferrisia wautieri* (Mirolli 1960) a small freshwater limpet first noticed in Britain by Dr T. A. Reader of Portsmouth Polytechnic. The limpet was first obtained in 1976 from an aquarium stocked with *Lymnaea* (*Radix*) *peregra* (Muller 1774) taken from a pond at Bishop's Waltham in Hampshire (Brown, 1977). Since that date it has been found in a pond near Parkhurst on the Isle of Wight (V.C. 10) by R. Preece in 1978; in East Sussex (V.C. 14), north of Barcombe Cross by D. Holyoak in 1978 and near Cowden by R. A. Dines in 1980; in West Norfolk (V.C. 28), R. Ouse at Hilgay by R. Wilmot and R. Preece in 1978; and in Bedfordshire (V.C. 30), R. Ouse at Gt Barford by R. Wilmot and R. Preece in 1978.

The discovery of this limpet at Elland is not just a first for Yorkshire, it also extends the known distribution of this tiny limpet considerably further north in Britain than previously recorded. Although not described until 1960, this limpet was first recorded in Europe as early as 1944 when specimens were found in central France (Calas, 1946 '*Gundlachia*'). Since then it has been recorded from Austria, Czechoslovakia, Hungary, Italy, Yugoslavia, and Romania. It has also been recorded from the highlands of Ethiopia.

In the Calder and Hebble Canal the limpet seems to occur almost exclusively on the alien water plants *Egeria densa* and *Lagarosyphon major*, although a few specimens were located on *Glyceria aquatica* after a detailed search of the aquatic plants by Mr and Mrs D. Shields and myself. The introduction of both *Egeria densa* and *Lagarosyphon major* is attributed to the activities of aquarists, both having been first recorded together in a section of the Ashton Canal at Droylsden near Manchester in 1953. (Morphy *et al.*, 1980). *Egeria densa* is a native of South and Central America, whilst *Lagarosyphon major* originates from South Africa.

A number of freshwater mollusca were found in association with *Ferrisia wautieri*, including the pond limpet *Acroloxus lacustris* (L. 1758). Small or immature specimens of *A. lacustris* can be separated from the much smaller *Ferrisia* by the following characteristics: *A. lacustris* has a distinct hooked apex on its shell which turns to the left, whereas the apex *Ferrisia* is blunt and turns to the right (Brown, 1977). A full list of associates is as follows:

Bithynia tentaculata (L. 1758)
Physa cf *acuta* Drap. 1805
Lymnaea (Galba) truncatula (Muller 1774)
L. (Lymnaea) stagnalis (L. 1758)
L. (Radix) auricularia (L. 1758)
L. (Radix) peregra (Muller 1774)
Planorbis carinatus Muller 1774
Anisus (Disculifer) vortex (L. 1758)
Gyraulus albus (Muller 1774)
Planorbarius corneus (L. 1758)
Acroloxus lacustris (L. 1758)
Sphaerium corneum (L. 1758)

The number of recorded localities in which this small limpet has occurred suggests that it has been spread rather widely throughout Britain and, therefore, it is probable that it will be found in other suitable habitats in Yorkshire.

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NEW HABITATS AND LOCALITIES FOR TWO ARCTIC SAWFLIES (HYM., TENTHREDINIDAE)

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It is apparent that the majority of sawflies occurring on the arctic tundra have a requirement for open habitats. If they survive in areas south of the present day tundra, they must either be restricted to areas above the tree line or localities at lower levels that were not, for various reasons, overrun by forest or blanket bog at any time during the period following the end of the last glaciation (Benson, 1958a). Survival for arctic insects during the Atlantic period in Britain must have posed almost as many problems as survival during the glaciation did for more temperate ones.

Pristiphora carinata (Hartig) and *P. mollis* (Hartig) (Nematinae) are typical members of the arctic sawfly fauna. Both feed on *Vaccinium* and fly from early spring till early summer. *P. carinata* is a Palaearctic and *P. mollis* a Holarctic arctic-alpine species. They have similar European distributions, being most abundant in northern Fennoscandia, the Scottish mountains and the Alps, but also occur rarely and locally at lower altitudes in Denmark, North Germany and North Britain. The British distribution given by Benson (1958b) for *carinata* is Braemar (Aberdeenshire), Aviemore area (Inverness) and high moorland in Radnor Forest (Wales). Subsequent collecting has added White Coomb in the Scottish Borders (Liston, 1980). All these are open, moorland localities. *P. mollis* has a wider distribution over many mountain and moorland localities in the Scottish Highlands, the Pennines, Wales, and Ireland. There are no published records from any of the Scottish islands, but I have recently examined one male in the Royal Scottish Museum, Edinburgh, collected by Dr A. R. Waterston at Craigston, Barra, Outer Hebrides on 20 April 1981.

In view of their known habitat preferences, I was surprised to sweep two males of *mollis* whilst Dr K. Bland swept a female *carinata* from dense carpets of *Vaccinium vitis-idaea* and *V. myrtillus* growing in closed *Pinus sylvestris* forest with *Juniperus* understorey (Abernethy Forest, Inverness, 2 May 1981). Perhaps even more surprising was the subsequent identification of a male *mollis* that had been swept from *V. myrtillus* in a small birch wood beside the Redmoss (a raised bog dominated by *Calluna* and without *Vaccinium*) near Balerno, Midlothian, 17 April 1981. This locality is only 260 m above sea-level. Ability to survive in such wooded localities is unusual in arctic sawflies, albeit under tree species that cast little shade and were in any case the first stage in the replacement of the tundra plant community by forest.

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THE BREEDING POPULATION OF OYSTERCATCHERS IN NORTH-WEST ENGLAND

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The British Oystercatcher *Haematopus ostralegus* population has been described by Buxton (1961) and Dare (1966), and reassessed for the years 1968–72 by Sharrock (1976). All document a continuing increase in Britain resulting from decreased human predation. In north-west England, detailed figures of the increasing breeding population are given by Greenhalgh (1969, 1972) who suggested a repeat of the survey in *c.* 1982. An intensive study of the ecology of inland breeding Oystercatchers in the Lune Valley was started in 1978 and for comparitive work, the numbers of breeding and non-breeding birds in the Morecambe Bay area was required. For each of the years 1978–80, complete censuses were made to establish the numbers of coastal breeding pairs from Walney Island (Cumbria) to the Wyre Estuary (Lancashire). River breeding pairs were recorded from the B.T.O. Waterways' Bird Survey results and other miscellaneous pairs from the Lancaster and District Birdwatching Society's Breeding Bird tetrad mapping scheme.

Breeding Populations

The results produced here also compare coastal and inland populations and examine the rate of colonization inland using previous data. The distribution map for the year 1980 shows the breeding pairs in Morecambe Bay and the Lune Valley (Fig 1). There has been a 50 per cent increase in the total number of breeding pairs since 1968 with much of the increase occurring in the river valleys (Table 1).

Coastal breeding birds have remained relatively constant on Walney Island with about 50–60 pairs, mainly on the Nature Reserve. Foulney Island, a shingle spit, has shown a dramatic increase from three pairs in 1978 to forty-two in 1980, possibly resulting from protection given by the newly formed Sandwich Tern *Sterna sandvicensis* colony and the associated wardening. The numbers breeding in the Cartmel area have decreased over the past ten years, mainly due to increased cattle grazing. Increases on the Carnforth Marsh possibly reflect the R.S.P.B. Reserve's management policies and losses on the Hest Bank Marsh indicate the problem of increased recreational pressure from the public. With the exception of some 100–120 pairs in the north-west corner of the bay, most other coastal and estuary breeders nest on the short, grazed, salt marsh turf. High densities of Oystercatchers occur on some of these saltmarshes and changes in numbers since 1968 reflect salt marsh dynamics and agricultural practices (Table 2). The Carnforth Marsh area is grazed by up to 8000 sheep in the summer; these keep the grass short which is preferred by the Oystercatchers, who can defend their clutches from trampling by sheep (Coomber, 1978). Silverdale Marsh is being rapidly eroded by the River Kent and so the breeding population has moved. The Pilling and Cockerham pairs have slightly increased resulting from the nesting habitat provided by the sea walls, newly erected in July 1978, to enclose land for reclamation, the earth banks having broken in the 1978 winter gales; the banks now exist as a series of bare mud mounds ideally sited above the summer high tide level. Cattle stocking rates on Colloway Marsh are now only 0.25 per hectare and as no sheep have been grazed for at least four years there is now an increase of breeding pairs on the Lune Estuary Marsh.

The majority of inland breeding Oystercatchers nest on the gravels by the side of rivers. Their numbers are still increasing, as shown by the pairs on the River Lune (Table 3). The 1979 figures for inland and coastal breeding pairs are unusually high, but work on a colour marked population, at Arkholme in the Lune Valley, indicates that, as a result of the previous cold winter, not all birds returned to the breeding grounds with sufficient protein reserves for reproduction. This resulted in the 'divorce' of many established pairs, as the earliest arrivals selected mates from the non-breeding flock. Later arrivals needed to select new partners, thus extending the breeding period and increasing the number of pairs. In 1980, most of these new

pairings and territories were not re-established. However, the riparian gravel nesting pairs do seem to have reached saturation on many areas of the river bank and some birds have moved onto fields adjacent to the river.

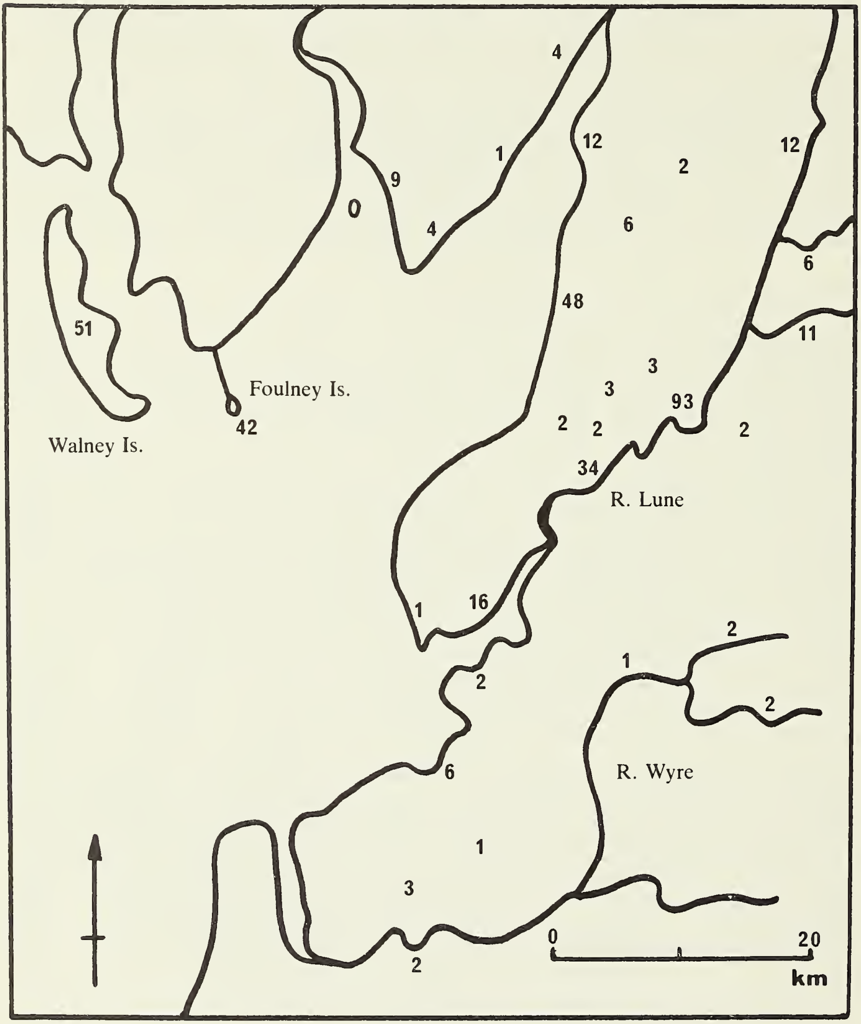

FIGURE 1
Map showing the area of north-west England included in this study with the number of pairs of Oystercatchers marked.

TABLE 1

The Oystercatcher population in north-west England for coastal and inland habitats (1978–80)

Year	Coastal	%	River	%	Other	%	Total
1968	158	73	60	27	—	—	218
1978	220	58	143	38	14	4	377
1979	231	54	178	42	20	4	429
1980	200	52	160	42	22	6	382

Note. 'Other' sites include such miscellaneous inland areas as gravel pits, railway lines and quarries. The 1968 figures are from Greenhalgh (1969).

TABLE 2

Oystercatcher populations of salt marshes between the Wyre Estuary, Lancashire and the Kent Estuary, Cumbria in 1978–80

	Number of Pairs				Pairs/100 hectares	
Salt Marsh	1968	1978	1979	1980	1968	1980
Pilling and Cockerham	5	3	8	8	1.1	1.8
Colloway	12	12	17	16	5.5	27.7
Middleton	1	—	—	1	2.2	2.2
Hest Bank	5	—	—	—	2.7	—
Carnforth	21	27	38	40	6.3	12.0
Silverdale	4	10	11	8	2.5	5.1
Arnside	11	11	11	12	28.9	31.6

Note. The 1968 figures are from Greenhalgh (1969).

TABLE 3

The Oystercatcher population of the Lune Valley between Lancaster and Kirkby Lonsdale (22.5 km), 1963–80

Year	Number of Pairs	Density (pair/km)	Data Source
1963	38	1.69	Dare, 1966
1966	40	1.78	Greenhalgh, 1969
1967	47–51	1.82–2.26	Greenhalgh, 1969
1968	52–54	2.31–2.40	Greenhalgh, 1969
1976	106	4.70	This study
1977	115	5.10	This study
1978	135	5.99	This study
1979	148	6.57	This study
1980	137	6.08	This study

Development of Inland Breeding

The stages of Oystercatcher colonization for inland habitats given by Dare (1966) are, firstly, slow river gravels, then adjacent fields and, finally, agricultural land or moorland away from any body of water. In the Lune Valley, Oystercatchers first bred at Arkholme in 1928; fifty years later the population on a 5-km stretch of river bank in this area was forty-five pairs, all but 8 per cent breeding on the river gravels. Experimental work on the pairs at this site has shown that all birds feed in the fields on invertebrates. Nesting on fields is limited because up to 92 per cent is grazed and very litle tilled land occurs. The latter is the preferred nesting habitat in north-east Scotland (Hepplestone, 1972). For nesting, the birds prefer a loose substrate. Very little is to be found in riverside pastures, apart from flood debris, but there is plenty of riverside gravel. At Arkholme, egg survival experiments have shown that birds nesting on the pastures will have little or no success due to egg loss resulting from the high stocking rate (3 cows and 4 sheep/hectare) and the very dense corvid population (3 Crow *Corvus corone* and 5 Magpie *Pica pica* pairs/km^2). These factors seem to ensure that, to be successful, breeding pairs must remain on the riverside gravels. However, nesting at high densities in areas likely to flooded by river spates gives poor reproductive success and nest records show that pairs at low density in ungrazed fields have much higher productivity. After fifty years, very few Oystercatchers are breeding well away from water.

TABLE 4

Field Usage, breeding pairs and proportional nesting of Oystercatchers on the River Lune, and adjacent fields, from Wenning Foot to Kirkby Lonsdale (14.5 km) for 1978–80

Year	61 fields		Pairs present	% Pairs nesting on		
	% grass	% tilled		grass	tilled	gravel
1978	92	8	76	4	—	96
1979	92	8	95	12	3	85
1980	94	6	93	1	9	90

Comparison of Two Inland Nesting Areas

A transect of a 14.5-km stretch of the River Lune and the fields adjacent (Table 4) show that the majority of Oystercatcher pairs breed on the riverside gravel. In 1979, the river level was very high and normal gravel-nesting birds were unable to use their traditional sites and so ten pairs attempted nesting on flood debris on the pasture. All but two returned to the gravel sites in 1980. Birds will also move from the river gravel sites to nest in newly seeded grass leys, but usually return the following year to the riverside when the tilled site reverts back to pasture.

Similar length transects were taken along the road from Over Kellet to Kirkby Lonsdale, about 3–4 km from the river. Here again (Table 5) there is little tilled land, but pairs do use such sites for breeding when it increases. The pairs in this habitat are increasing and have possibly reached stage three of the inland colonization. They produce clutches later than the gravel-breeding birds, nesting in fields left for silage or hay crops after being grazed in March and April by sheep and lambs.

Further Inland Breeding

Not all inland breeding pairs are associated with rivers or agricultural land; six breed around the Dock Acres gravel works near Carnforth, two in a working limestone quarry near Burton and a further two breed on moorland near Claughton. The movement onto agricultural land could happen suddenly with a change in agricultural practice increasing arable areas. (This happened in north-east Scotland during the 1950s when barley production was greatly increased.) In 1968, only 27 per cent of the total population of Oystercatchers in north-west England had adapted to feeding inland during the breeding season, but more recent surveys show the figure to be around 45 per cent.

TABLE 5

Field usage, breeding pairs and proportional nesting of Oystercatchers for roadside fields between Over Kellet and Kirkby Lonsdale (14.8 km) for 1978–80

Year	158 fields		Pairs present	% Pairs nesting on	
	% grass	% tilled		grass	tilled
1978	94	6	3	100	—
1979	94	6	6	100	—
1980	87	13	10	80	20

Conclusions

The proportion of inland to coastal breeders over the three years surveyed (Table 1) has increased since 1968, possibly reflecting a behavioural change giving increased breeding success for inland breeders as described by Hepplestone (1972). The extent to which this increase can occur will be limited by agricultural practices, as successful nesting on riverside gravel is limited by gravel size and position (Briggs, 1981), and most such areas are now so densely populated that productivity is reduced because of inter-specific conflict.

The birds' behavioural adaption means that because of their longevity there is a large reservoir of birds ready to move onto the preferred agricultural land when it occurs. The present farming practice means that fifty years after first colonizing the river gravels in north-west Lancashire, only 6 per cent of the total inland breeding Oystercatcher population nest on fields adjacent to the river bank and 3 per cent breed away from any large body of water. Other changes, envisaged in plans for the Lune Valley by the North West Water Authority to limit winter flooding, could cause the loss of riverside gravel. Similarly, the Central and North Lancashire Structure Plan gives no safeguards for the Lune Valley wildlife and hints at possible large-scale gravel extraction. Both schemes would cause the Oystercatcher population to move from its present preferred nesting habitat and also greatly affect the diversity of bird life along the River Lune. An analysis of the B.T.O. Waterways Bird Survey results (Marchant and Hyde, 1980) shows that the Lower Lune Valley had the most dense and varied bird population to be recorded by the Survey.

Acknowledgements

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BOOK REVIEWS

The Biological Aspects of Rare Plant Conservation edited by **Hugh Synge**. Pp. xxviii + 558, including numerous figures and tables. Wiley, Chichester. 1981. £30.
This book contains not only the proceedings of an international conference held at King's College, Cambridge (14 — 19 July 1980), but also an additional wealth of reference material. Technical chapters on such topics as survey and assessment, monitoring, population ecology and introductions are backed-up by extensive bibliographies and appendices (including short notes and abstracts of additional papers received, and a comprehensive bibliography of Red Data Books and threatened plant lists). A wide range of species, habitats and countries (N. America, Europe, Scandinavia, USSR, Africa, India, S. E. Asia and Australasia) are covered. The book deals with the conservation of vascular plants, excepting an edited report (13 pages) of a panel discussion on the conservation of lower plants. The sections on 'ecological studies of rare plants' and 'introductions and re-introductions' deal mainly with British species and sites. An important source-book for conservationists, and both amateur and professional botanists.

MRDS

Countryside Conservation. The Protection and Management of Amenity Ecosystems by **Bryn Green**. Pp. xiv + 249, including line drawings and b/w plates. The Resource Management Series No. 3. Allen & Unwin. 1981. £13 hardback, £6.95 paperback.
The landscape and wildlife features of the various British habitats, and the major ecological processes operating on them, are treated in detail. Well-argued reasons are presented for the preservation of particular ecosystems, paying attention to the aesthetic and amenity values and the need for genetic diversity in animal and plant stocks. Preservation is not sufficient, and careful management is advocated. Recommended for teachers, students and amateurs interested in the preservation of the countryside.

Mushrooms and Other Fungi of Great Britain and Europe by **Roger Phillips**. Pp. 288, lavishly illustrated in full colour. Pan Books. 1981. £6.95 paperback (simultaneously issued in hardback by Ward Lock, £10.95).
It is indeed, as the cover-title states, 'the most comprehensively illustrated book on the subject this century', with undoubtedly the best coloured photographs of the largest number of British species in any book available. The format is unsuitable for use in the field, but, with the aid of this book, it should be possible to successfully identify a high proportion of the day's collection in the home or laboratory. Highly recommended.

British Mosses and Liverworts by **E. V. Watson**. Pp. xviii + 519, including 260 figures and plates. Cambridge University Press. 1981. 3rd edition. £25 hardback, £12.95 paperback.
A thorough revision of the standard introductory guide to the identification of British bryophytes, a revision which has resulted in numerous taxonomic and nomenclatural changes, the introduction of more technical detail, and the incorporation of a further 26 species (mainly mosses). One helpful feature of the first edition, unfortunately omitted from the second edition, has been reinstated, viz. the direct reference of the keyed species to the relevant description in the text. The excellent keys, lucid taxonomic descriptions and habitat notes and clear illustrations all combine to provide the student with an indispensable guide to almost all the species he is likely to encounter.

MRDS

Farming and Wildlife by **Kenneth Mellanby**. Pp. 178 (including 8 figures + 4 tables), plus 24 pages b/w photographic plates. New Naturalist No. 67. Collins. 1981. £9.50.
A forthright and dispassionate account of what is happening to 80 per cent of the land in Britain. The approach is essentially fatalistic, with the inevitable conflict between farming and conservation clearly presented; particular attention is paid to the use of chemicals and to 'improvements', such as hedgerow removal and drainage, carried out in the interests of efficient farming. Alas, many farming practices today militate against wildlife conservation.

THE OCCURRENCE OF *ASELLUS* (CRUSTACEA: ISOPODA) ON OFFSHORE ISLANDS IN THE BRITISH ISLES

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The recent review of the occurrence in the British Isles of *Asellus* spp. (Moon & Harding, 1981) included distribution maps for the three native species. The scale of the maps was such that the occurrence of species on offshore islands was ill-defined. This note records the known occurrence of *Asellus* on all islands off the coasts of Britain and Ireland, and in the Channel Islands.

The presence of *Asellus* on offshore islands raises the problem of how freshwater species without special means of dispersal (other than the brooding of young by females) have arrived at often remote locations. No answer to this problem is given here, but the possibility of accidental transport by man cannot be ignored. More collecting is needed to establish the true distribution of *Asellus* in the British Isles. Collections from the smaller islands should be made with restraint, as freshwater habitats are often scarce, small and vulnerable to over-collecting.

The following list of islands is arranged in three sections: (1) islands where only *Asellus meridianus* has been recorded; (2) islands where both *A. aquaticus* and *A. meridianus* have been recorded; (3) islands where *Asellus* have been sought but not yet found. For each island, the area is given in hectares, the year in which *Asellus* was recorded, and the name of the recorder. More complete data on localities and habitats are included with the records of the British Isopoda Study Group deposited at the Institute of Terrestrial Ecology's Biological Records Centre at Monks Wood.

1. *Asellus meridianus* only

Channel Islands	Guernsey (6,335 ha.), 1958, W. A. Smith. Sark (516 ha.), 1951, J. Moody
England	Isle of Wight (38,101 ha.), 1960, H. B. N. Hynes Tresco, Scilly Islands (372 ha.), 1959, Charterhouse School Lundy (423 ha.), 1952 (Galliford, 1954); 1959, L. A. Harvey
Wales	Skokholm (99 ha.), 1950, J. Moody; 1952, H. P. Moon Skomer Island (307 ha.), 1971, R. P. Bray Bardsey (180 ha.), 1933 (Kidd, Pyefinch & Butler, 1935); 1935 (Pyefinch, 1937); 1951, H. B. N. Hynes
Isle of Man	(57,169 ha.), 1945/46, C. I. Paton & R. Wagstaffe (W. E. Collinge Collection) (Moon, 1953, Harding & Moon, 1976); 1959, H. B. N. Hynes; 1960, R. O. Brinkhurst
Scotland	Bute (12,140 ha.), 1973, G. McNae (Hamilton, 1974) Islay (103,383 ha.), 1974, D. W. Mackay (Hamilton, 1974)
Ireland	Inisheer, Aran Islands (586 ha.), 1973, D. McGrath

2. *Asellus aquaticus* and *A. meridianus*

Wales	Anglesey and Holy Island (71,482 ha.), 1950–1961, H. B. N. Hynes, T. B. Reynoldson, W. D. Williams (1963); 1973, T. E. Byford (1974)

* Professor H. P. Moon died on 26 March 1982

3. No *Asellus* sp. found

Scotland	Rhum (10,684 ha.), G. Fryer
	St Kilda (853 ha.), J. D. Hamilton
	Orkney (97,470), P. T. Harding (Mainland only)
	Fair Isle, P. E. Davis
	Shetland (142,583 ha.), R. H. Britton (1974)

With the exception of Anglesey, all records of *Asellus* from offshore islands so far received have been of *A. meridianus*. This species is probably favoured by the high sodium content of waters on islands (sodium being derived from sea spray), as *A. aquaticus* is adapted to a lower sodium content in water (Sutcliffe, 1974). On Anglesey *A. meridianus* is apparently the commoner of the two species; where *A. aquaticus* occurs there is usually a mixed population of the two species. Much remains to be discovered about the factors limiting the occurrence of *Asellus* in the British Isles. The distribution of all species is poorly recorded, and P.T.H. would welcome specimens or authenticated records from any area.

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FIELD NOTE

Delayed emergence of *Erannis defoliaria* (Clerck)

While walking in Melton Wood, near Doncaster, on the afternoon of 17 January 1982, I found one male and two females of *E. defoliaria* (Mottled Umber) at rest on the trunks of separate trees; at the same locality on the evening of 29 January a further male was attracted to actinic fluorescent light. These late records of a moth whose normal emergence period is from October to December are almost certainly attributable to the extremely cold weather during the second half of December 1981. There is only one previous January occurrence of *E. defoliaria* recorded in the Y.N.U. lepidoptera card index, a female taken at Wyke, near Bradford on 22 January 1923 by W. Barraclough.

Harry E. Beaumont

THE DUCK DECOYS OF SOUTH-EAST YORKSHIRE: AN ADDENDUM

MARTIN LIMBERT
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Denaby Decoy

A few scattered details of this decoy have added significantly to the meagre facts already on record (Limbert 1978). The map showing the tithe rent-charges for the parish of High Melton (confirmed 1847), shows the decoy pool, or at least a pond, and in the accompanying award the pool was noted as being part of a 2-acre (0.8 ha.) parcel of land described as 'Plantation Rough Ground and Pond'.

The decoy was not named as such on maps until much later and the inference drawn must be that what was probably a pond (of uncertain origin) was adapted as a decoy at a later date. Neither the tithe map nor the 1854 6″ Ordnance Survey map show pipes, or label the pond as a decoy, and the O.S. map at least would have shown any existing pipes.

At the time when the tithe map was drawn, the pond formed a part of the estate of Andrew Montagu, who was succeeded on his death in 1895 by his nephew Frederick. The Montagu estates at Barnburgh and Melton were eventually sold, and in the 1927 sale catalogue, the pond in question was listed as a decoy. However, the significance of this diminishes, since correspondence relating to the sale of these estates contains a letter (dated 14 October 1926) which described the wood around the alleged decoy as 'Duck Pond Plantation', perhaps a more honest (even if implied) description of the water involved. It may also be significant in this respect that Denaby Decoy was not included in Whitaker's survey of existing duck decoys and traps published in 1918.

By a conveyance dated 3 October 1928, Frederick Montagu sold the land which included the decoy to the Urban District Council of Mexborough. In the documents of this conveyance it was stated that the decoy pool extended ovcr 1.011 acres (0.404 ha.) and was surrounded by plantations, then 4.571 acres (1.828 ha.) in extent. Within the plantations a boathouse was marked, though without an obvious connection to the pool. The southern boundary of the plantations was delineated by what was then the race of Melton Mill.

Thus from cartographic and written information there is no evidence that Denaby Decoy was ever a true pipe decoy; it seems to have been, at best, an unsophisticated trapping site for ducks, using a method neither recorded nor remembered, and carried on for an unknown span of years.

Ground evidence supports the inference that pipes have never existed. The decoy pool is embanked, and there are only two breaks in this embankment. One of these was dug in 1965, to drain the pool into what is now the old course of the River Dearne. The other, at the northern point of the decoy, is older, and although it may be associated with the origins of the decoy, it is, however, more likely to represent an old watercourse.

There is one further, though less satisfactory, source of information. In February 1981, I examined a painting, unfortunately very dingy, which claimed to depict Denaby Decoy. It had originally been bought at a sale of items from Melton Hall, though the 1927 sale catalogue contains no details. The painting, which was again up for sale when I saw it, is signed by an unknown artist, Clement Morris, and is undated, but is apparently late nineteenth century. If authentic, the work appears to show the old mill race to the south of the decoy in the background, and depicts a direct link with the decoy pool, a part of which is shown in the foreground. Beyond showing an idyllic pool and a pleasant cottage, there is little of significance in the picture — no hint of any decoy features — and its importance is diminished by the fact that it is not a proven representation of the decoy.

The map reference given recently (Limbert 1978) should read SE/498013.

New Zealand Decoy

J. Birtwistle of Limberlost Farm has shown me the site of New Zealand Decoy. Its position, at map reference SE/733125, was originally moorland — the southern extremity of Thorne Moors — but it was reclaimed ca. 1912. Farming at New Zealand commenced during the First World

War, but was abandoned in the late 1920's. However, the area was subsequently cleared again, and was recultivated possibly during, and certainly after, the Second World War.

Although the site is now ploughed over completely, the decoy allegedly remained clearly visible until about the early 1930's, and the site was still discernible in 1967, showing as an apparent crop-mark on an aerial photograph. New Zealand Decoy was reportedly an acre (0.4 ha.) in extent, and had four pipes (corroborating Payne-Gallwey 1886).

Thorne Decoy

Woodruffe-Peacock (1920–1) stated that there had been at least six decoys on or close to Thorne Moors. Five of these were detailed recently, and the sixth was described as 'unknown' (Limbert 1978). An unnamed decoy (labelled simply 'Decoy'), lying very close to the Thorne — Snaith/Cowick parish boundary, at map reference SE/709180 on the 6″ O.S. map of 1853, is presumably the lost, sixth decoy, for which the name 'Thorne Decoy' seems the most appropriate.

Its position was on the north-west edge of Thorne Moors, close to Top Moors Farm (the last part of which was demolished in the early 1970's). The decoy, as represented, was a roughly oval pool ca. 1.5 acres (0.6 ha.) in extent, with no sign of pipes, but with what appears to have been an island in the middle of the pool, and a small pond in the centre of the island. The decoy pool adjoined a drain on its western side and was located within ca. 14 acres (5.7 ha.) of 'mixed wood', on or adjoining the moor edge. The lack of any pipes on the 1853 map strongly suggests that Thorne Decoy was not a pipe decoy, but operated on cruder principles, again probably more akin to trapping.

Although there is no direct evidence, it is possible that the construction nearby of the Thorne — Goole railway (opened in 1869) was a factor in the demise of Thorne Decoy. The pool is now obliterated by agriculture, but its site is still very close to the present moor edge.

The vicar or curate of Snaith had a right to 2 acres of turbary ('Priory Moors') on Snaith and Cowick Moors. This right was sold in 1859 to the executors of the will of a local entrepreneurial landowner, Ralph Creyke, formerly of Rawcliffe (Robinson 1861). A farm known as Priory Farm still exists. The 1853 map shows irregular tracks on the moors from Priory Farm (at that time the moorland extended to the farm), probably associated with this right of turbary. They lay just to the north-east of the decoy, but the fact that 'Priory Moors' and the decoy lay on different sides of the parish boundary suggests there was no ecclesiastical connection between them, despite their close proximity and contemporaneity.

Goole Old Decoy (Airmyn Decoy)

In my earlier paper, I tentatively placed this decoy at map reference SE/717208. The 6″ O.S. map of 1853 shows a small (?residual) pool, labelled 'Armin Decoy' at SE/717215 adjacent to Decoy Farm. Airmyn village lies over 3 km NNE of Decoy Farm, and both farm and decoy site lie on the south-west edge of Airmyn parish.

Other Possible Decoy Sites

With six decoys on/around Thorne Moors, it seemed likely that decoys may have existed on or in the vicinity of Hatfield Moors, a superficially similar moorland ca. 5 km southwards. However, no cartographic or literary evidence has come to light and the possibility also seems discounted by a quotation from Stonehouse (1839), written during the heyday of decoying: '[On Hatfield Moors] A small space, of several yards square has been covered about three inches thick with warp, by way of experiment, on which was growing at the time of my visit [1836] a luxuriant crop of white clover and other seeds. I cannot help thinking however, that a decoy for wildfowl, on a large scale, now that there are such facilities for sending them to the great markets, would yield by far the greatest profits with the least outlay of capital.'

Other possible decoy sites investigated in south-east Yorkshire (eg Sandbeck Park, West Moor) have also proved negative. However, at least one decoy may yet remain to be rediscovered. In the *Philosophical Transactions* of the Royal Society of London, Abraham de la Pryme commented in a letter dated 19 November 1701: 'And as the Reverend and Ingenious *Mr*

Earat Min. of *Hatfield*, my ever Honour'd Master, lately observ'd in the Digging of the Pit of a Great Decoy in these Levels [Hatfield Chase], the Roots of the Firs or Pitch-Trees always stood in the Sand, and the Oaks in the Clay'. Although this may refer to a decoy already listed, the possibility of its provenance nearer to Hatfield cannot be eliminated without further proof.

ACKNOWLEDGEMENTS

I am grateful to Messrs H. E. Beaumont, J. Birtwistle, M. Hobson and L. Smith for their helpful co-operation. My thanks are also due to the Archives Department and the Legal and Administrative Department of Doncaster Metropolitan Borough Council, and Sheffield City Libraries, for allowing me to see documents of relevance to Denaby Decoy.

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GEORGE STABLER AND THE BRYOPHYTES OF DENTDALE

T. L. BLOCKEEL

Bryological visitors to Dentdale usually have in mind certain important records made by George Stabler. Stabler (1839–1910) lived for most of his life in Westmorland, being village schoolmaster at Levens until he lost his sight in later life. Further biographical details may be found in Waddell's obituary in the *Journal of Botany* (Waddell, 1910). Stabler's *magnum opus*, published in instalments in the Naturalist between 1888 and 1898, was 'The Hepaticae and Musci of Westmorland', but he also visited many parts of adjacent counties. Of his visits to the Dent Valley, he wrote in 1879:

'In the same year [1872] I also found *Sphagnum teres* and *Habrodon Notarisii* — the latter on an ash near the river, and since that time on sycamore near the same place.

'In the year 1872 I paid two visits to Dent, and along with many other species, were collected the following: *Plagiochila spinulosa*, N. ab E. *Jungermannia Genthiana*, N. ab E.; *J. pumila*, With.; *Saccogyna viticulosa*, Dum.; *Mastigobryum trilobatum*, N. ab E.; *Lejeunea minutissima*, Dum. (on trees); *Frullania fragilifolia*, Tay.; *Metzgeria conjugata*, Lindb.; *Reboulia hemisphrica* [sic], Radd.; *Pellia calycina*, N. ab E.

'On the 1st of September, 1877 (I will not disguise my feelings on the occasion) I was delighted to find *Lejeunea hamatifolia* growing in the same district; and this leads me to think that I could not find a more fitting opportunity to place on record something I have done. It is this: Dr. Moore, of the Royal Botanic Garden, Glasnevin, with his usual liberality sent me fine living specimens of *Dumortiera irrigua*, N. ab E., and on my next visit to Dent to get more of the *Lejeunea hamatifolia* (alas! it is rather scarce), I planted a fine healthy specimen of the

Dumortiera, which I trust will thrive and multiply. This is now about a year ago.' (Stabler, 1879.)

Three of these records are particularly important, *Lejeunea hamatifolia* (*Drepanolejeunea hamatifolia*), *L. minutissima* (*Cololejeunea minutissima*), and *Habrodon notarisii* (*Habrodon perpusillus*). Since none of the three has been refound in Dentdale, it has long been desirable to have confirmation of the original gatherings. Stabler's extensive collection is now housed at Kendal Museum, and with the help and permission of Mr W. M. Grange I have been able to examine the original packets.

The *Drepanolejeunea* and *Habrodon* records are correct. There is plentiful material of the former, in spite of Stabler's comments about its scarcity. Its only other station in Yorkshire is at Ingleton, where it still flourishes. The *Habrodon* material is also excellent; it is otherwise unknown from Yorkshire.

The *Lejeunea minutissima* is the plant now known as *Lejeunea ulicina*, and *Cololejeunea minutissima* should be deleted from the Yorkshire lists. I suspect that the error is merely nomenclatural, since the older bryologists included *Lejeunea ulicina* in *L. minutissima*. Thus in Miall & Carrington (1862) the two taxa are treated as varieties under the name *Lejeunia minutissima*, Smith. They refer a collection by John Nowell from Sheddon Clough to a variety 'b stipules obsolete', but even if this was the true *Cololejeunea minutissima*, the locality was in Lancashire (V.C. 59). I believe that if Stabler had been consciously referring to the rarer species, he would have made special mention of his discovery, as he did of the *Drepanolejeunea*.

I was also able to examine a packet of *Frullania fragilifolia*. The name was already queried on the packet, and I would refer it to a form of F. *tamarisci*. Though some leaves have scattered ocelli, the better developed underleaves have the shape and recurved margins of the latter species.

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YNU BRYOLOGICAL SECTION: ANNUAL REPORT 1981

T. L. BLOCKEEL

Excursions

The autumn meeting of the Bryological Section in 1980 was held in the Kilburn area (V.C. 62) with the particular object of searching for *Seligeria diversifolia* in its only British station at Wass Bank, where it was discovered by Mr F. E. Branson during the spring meeting in 1971. Although there was some quantity of *Seligeria* present, all the material appeared referable to *S. recurvata* and *S. diversifolia* is either rare or not easily detectable. A few species were collected that were not seen on the earlier excursion (Branson, 1971): these included *Zygodon viridissimus* var *stirtonii* on shaded limestone, and *Encalypta vulgaris*, *Aloina aloides* var *aloides*, *Pottia starkeana* spp *conica,* and *Barbula hornschuchiana* in an old quarry at the head of the bank.

Earlier, a visit was made to Oldstead Bank, where the flora was mostly calcifuge, although *Taxiphyllum wisgrillii* was recorded. There was nice material of *Campylopus fragilis* on sandstone rocks, an often mis-recorded species. On soil by the path and in a gateway were *Pottia starkeana* ssp *conica*, *Bryum ruderale* and *B. klinggraeffii.*

The spring meeting in 1981 was held in Lothersdale (V.C. 63) on 2 May. The Section was pleased to welcome members of the North Western Naturalists Bryological group in what is hoped will be the first of many joint excursions.

The carboniferous limestone reaches its southernmost limit within Yorkshire in the Lothersdale area, and, although the limestone is dark and impure, the communities it supports are absent from much of the vice-county. The walls by the lane at the western end of Lothersdale Quarry had typical calcicoles, including *Encalypta streptocarpa*, *Tortula intermedia*, *T. subulata*, *Barbula revoluta*, *B. cylindrica*, *Schistidium apocarpum*, *Grimmia pulvinata*, *Orthotrichum*

diaphanum, *O. anomalum*, *Neckera complanata*, *Thamnobryum alopecurum* and *Homalothecium sericeum*. Some of these species also grew on trees encrusted with lime dust, and *Orthotrichum affine* was found in this habitat. Species on grassy banks by the stream included plentiful *Ctenidium molluscum* and some *Homalothecium lutescens*. The quarry itself was disappointing, since there were few undisturbed areas. However, *Aloina aloides* var *aloides* and small *Campylium stellatum* were found on bare gound at the edge of the quarry. Miscellaneous records from the area included *Mnium stellare* and *Fissidens adianthoides*.

A visit was also made to Gill Beck near Cowling. A flushed slope in pasture had *Fossombronia pusilla*, *Dicranella schreberana* and *Physcomitrium pyriforme* on damp soil, and some quantity of fruiting *Calliergon cuspidatum*. *Plagiothecium curvifolium* was on rotten wood, *Rhacomitrium fasciculare* on a stone, and some *Pleuridium* on soil on a grassy bank. Withered antheridia detected in the perichaetial leaves of some plants showed that it was *P. acuminatum*, but one or two stems had single bud-like axillary inflorescences of the sort which characterize *P. subulatum*. Either these stems were abnormal, or there was some admixture of the latter species.

The autumn meeting in 1981 was held at Ravensgill near Pateley Bridge (V.C. 64) on 5 September. There was time to examine only a small part of the ravine, but it was pleasing to find *Jubula hutchinsiae* and *Isothecium holtii* still present in their only vice-county station. Other species noted included *Dicranodontium denudatum*, *Dicranum fuscescens*, *Heterocladium heteropterum*, *Seligeria recurvata*, *Sphagnum girgensohnii*, *Oxystegus tenuirostris*, *Lepidozia sylvatica*, *Mylia taylori*, *Plectocolea obovata*, *Nowellia curvifolia*, *Scapania gracilis*, *S. umbrosa* and *Solenostoma pumilum*. In an earlier report, Walsh (1950) commented on the poverty of epiphytes at this site. It is worth making the point that the area is well within the reach of relatively heavy atmospheric pollution, and that epiphytes appear to be more tolerant on limestone than on acidic substrata. Thus in the sheltered limestone woods by the Ribble near Gisburn, certain sensitive species can occur quite close to industrial Yorkshire. (See the records below.)

Literature

In addition to the usual reports, there have been a number of notes during the past year relevant to Yorkshire bryology. I have myself written briefly on the early bryologists of South-west Yorkshire, and on *Spagnum balticum* and *Octodiceras fontanum* in the county (Blockeel, 1981, 1980a, 1980b). With regard to the *Octodiceras*, I am grateful to Mr N. T. H. Holmes for drawing to my attention to his earlier report of the species, from the lower reaches of the Swale (Holmes & Whitton, 1977). The Rev N. Dennis and Miss M. E. Newton have published papers on Jethro Tinker, a Stalybridge naturalist who collected in the South Pennines, including parts of V.C. 63 (Dennis, 1981; Newton, 1981). Finally, Mrs J. A. Paton (1981a, 1981b) has published some taxonomic work on *Scapania*, including two rare species known from V.C. 64.

Records

The records listed here are believed to be new stations for the species. Unless stated otherwise, they are my own. An asterisk indicates a new vice-county record or amendment to the Census Catalogue.

Metzgeria temperata: (64) 34/84 On hazel, Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Metzgeria fruticulosa sens. str.: (62*) 45/71 Roxby Woods, J. Robertson, YNU Exc, May 1981.
Lepidozia trichoclados: (63*) 34/92 Hebden Valley, Mar 1981.
Bazzania trilobata: (63) 34/92 Hebden Valley, a second site, Mar 1981.
Ptilidium pulcherrimum: (64) 34/84 Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Calypogeia trichomanis: (64) 44/24 Bank by Lindley Wood Reservoir, J. Appleyard, Sept 1981.
Lophozia alpestris: (63*)44/00 Seal Bark Rocks, Saddleworth, Oct 1980; (64) 34/87 Among grit rocks, Pen-y-ghent, Aug 1981.
Lophozia perssonii: (63) 44/41 On magnesian limestone boulder, Went Valley, Jan 1981.
Lophozia bicrenata: (63) 44/00 Seal Bark Rocks, Saddleworth, Oct 1980.
Tritomaria exsectiformis: (63*) 44/00 Seal Bark Rocks, Saddleworth, Oct 1980.
Cephaloziella rubella: (63) 34/92 Bank in pasture, Hebden Valley, 1980.
Scapania curta sensu stricto: (63*) 44/03 Bank in pasture, Bingley, Nov 1981.
Scapania gracilis: (63) 34/92 & 93 Hebden Valley, Nov 1980.

Porella laevigata: (64) 34/67 Swilla Glen, Ingleton, Jul 1981.
Cololejeunea rossettiana: (64) 34/84 Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Lejeunea ulicina: (64) 34/84 Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Lejeunea lamacerina: (64) 34/86 Ribble Banks near Stainforth, Oct 1981.
Lejeunea patens: (63*) 44/00 Seal Bark Rocks, Saddleworth, Oct 1980.
Andreaea rothii: (63*) 43/29 Clough near Strines, June 1981.
Andreaea crassinervia: (63) 43/28 Rivelin Valley, June 1981; 43/29 Clough near Strines, June 1981; (64) 34/95 Embsay Moor, Aug 1981.
Fissidens exilis: (63) 43/69 Wood near Bawtry, Jan 1981; 44/61 Edge of arable field, Fishlake, Jan 1981; 44/62 Wood near Heck, Feb 1981; 44/13 Aire Banks, Bingley, Mar 1981.
Fissidens osmundoides: (63) 44/04 Newsholme Dean, Dec 1980.
Seligeria pusilla: (64) 34/84 Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Dicranum montanum: (64) 34/84 On hazel, Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Campylopus introflexus: (61*) 44/63 Near South Duffield, D. R. Grant, 1981.
Tortula stanfordensis: (64) 44/43 Under shrubs, Lotherton Hall, Feb 1981.
Aloina brevirostris: (63) 44/52 Disturbed ground by silt lagoon, Cridling Stubbs, Jan 1981.
Phascum floerkeanum: (64*) 44/34 Arable field near Thorner, Nov 1981.
Weissia rostellata: (63) 44/61 Edge of arable field near Fishlake, Jan 1981.
Discelium nudum: (64) 34/95 Embsay Moor, Aug 1981.
Schistostega pennata: (63) 43/49 Hooton Roberts, Apr 1981.
Pohlia camptotrachela: (62*) 45/71 Scaling Dam, TLB & J. Appleyard, YNU Exc, May 1981; (64*) 34/95 Edge of track near Rylstone, Aug 1981.
Plagiobryum zierii: (63*) 44/00 Seal Bark Rocks, Saddleworth, Oct 1980.
Bryum dunense (63*) 44/41 Magnesian limestone quarry, Wentbridge, Jan 1981.
Orthotrichum lyellii: (64) 34/77 On old ash tree, Upper Ribblesdale, Sept 1981.
Orthotrichum sprucei: (64) 44/24 By R. Wharfe near Pool, Sept 1981.
Ulota crispa var *crispa*: (64) 34/84 Small amount on hazel, Steep Wood, Ribble Banks, Gisburn, Aug 1981.
Plagiothecium latebricola: (63) 44/61 Wood near Fishlake, Jan 1981.
Plagiothecium laetum: (63*) 44/04 Newsholme Dean, Dec 1980.
Isopterygium pulchellum: (64) 34/78 Force Gill, Whernside, Oct 1981.
Hylocomium umbratum: (64*) 34/77 Twistleton Glen, new to Yorkshire, Aug 1981.

Paton (1981a) has reported *Scapania paludicola* new to Britain. One of the two gatherings is from Yorkshire: Denton Moor, Ilkley (V.C. 64), M. Dalby, Jan 1967. She has also redetermined British material of *Scapania mucronata* as *S. praetervisa*, including the Yorkshire gathering from Thorns Gill, Ribblehead (V.C. 64), J. Appleyard, 1952 (Paton, 1981b).

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BOOK REVIEWS

Ethology: its nature and relations with other sciences by **R. A. Hinde**. Pp. 320, with line drawings. Oxford University Press. 1982. £9.50, and Fontana Paperbacks. £2.95.

Published simultaneously as a handbook and a Fontana Masterguide, this book explores the current state of ethology — the study of animal behaviour. As one who has for many years worked at the coalface in British ethology, in constant touch with overseas workers, Robert Hinde is better qualified than most to write this account. A full and searching statement, it discusses both ethology itself and its relations with biology and human social science. Ethology clearly has much to learn from the one and to teach the other, especially in the field of applied psychology. I found this a worthy, academically meritorious book, if not a particularly stimulating one. Hinde's approach is less charismatic than Tinbergen's or Lorenz's, though no less founded in hard work in a demanding discipline. However, *Ethology* is an excellent review of the field, strongly recommended for serious students with more than a passing interest in animal and human behaviour, and good value in the paperback edition.

BS

Garden Shrubs by **Arthur Hellyer**, with drawings by **Nicholas Parlett**. Pp. viii + 248 (including numerous line drawings), and 8 pages of coloured plates. Dent. 1982. £12.

To see Arthur Hellyer's name on a title-page inspires immediate confidence. This is a thoroughly sound book on shrubs, full of helpful advice and clearly presented information. Guidance on the right choice of shrub for particular situations and effects, planting instructions, pest and disease control and propagation are amply covered, but the main part of the book is devoted to comprehensive coverage of all the shrub species, hyprids and cultivars which gardeners are likely to come across.

The least satisfactory aspect of the book is the lack of sufficient illustrations. Although the hundred or so line drawings are reasonably satisfactory, they can give no idea of the colour or general appearance of the shrub as a whole, and far too many unfamiliar shrubs are not illustrated at all.

VAH

Methods in Field Geology by **Frank Moseley**. Pp. 211, including numerous maps, sketches, diagrams and black and white photographs. W. H Freeman and Co. 1981. £6.50 softback, £12 hardback.

This volume is designed to give geology students guidance on how to obtain and present geological field information. The first part describes the properties and use of aerial and other stereographic photographs and gives sound advice on equipment and report writing. The remainder of the book uses a number of case studies, three of which relate to England, to illustrate approaches and recording techniques which are appropriate under a range of field conditions.

Throughout the book it is assumed that the student has a knowledge of geology appropriate to a geology undergraduate, and the work is clearly designed to complement a course of guided study rather than to provide the layman with self tuition.

DEC

The Ammonites: Their Life and World by **Ulrich Lehmann**. Pp. xii + 246 (including numerous figures and black and white photographs). Cambridge University Press. 1981. £9.95.

It is easy to understand why this work, first published in German in 1976, has been translated into English, as it provides a clear account of our current knowledge regarding the structure, evolution, feeding habits, locomotion and possible reasons for the demise of a fascinating group of fossil organisms. The abundance of clear line drawings illustrating aspects of ammonite morphology are a most attractive feature of the work. The volume provides an authoritative introduction to a specialized topic, at a moderately advanced level, which would be appropriate for students of zoology or palaeontology or to dedicated amateur fossil collectors who already have an outline knowledge of the field.

DEC

REQUEST FOR INFORMATION

LOUIS HUNTON. Information is sought about Yorkshire geologist Louis Hunton (1814–38), born at Loftus, son of William Hunton, an alum maker there, described by W. J. Arkell in 1933 (*The Jurassic System in Great Britain*, Oxford, Clarendon Press, p. 14) as a pioneer in the use of ammonites for the accurate correlation of Jurassic strata. This is an assessment based on Hunton's 1836 paper, published in 1837 in *Trans. Geol. Soc. London* (2) **5**: 215–20, and described by Arkell as a 'truly remarkable document' of 'remarkable qualities'. Basic biographical information about Hunton and his parents is now available, and at last his early fate is also known, as he died at Nimes in the south of France at the age of twenty-three, but any further information is sought and especially news of any of his publications apart from the above and another on chemistry in *London and Edinburgh Phil. Mag.* **11**: 152–6 (1837).

Dr H. S. Torrens, Department of Geology, University of Keele, Keele, Staffordshire ST5 5BG.

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The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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The 121st Annual Meeting

will be held at

HARROGATE

by invitation of the Harrogate and District Naturalists' Society

on Saturday, 4th December 1982

HEADQUARTERS: Crescent Room, Royal Baths, Harrogate

PROGRAMME

11.00 hrs Executive meeting in the Crescent Room.

13.00 hrs Lunch in the Baths Restaurant.
(Soup, Roast Beef, Trifle, Coffee — £4.05) (excluding service charge)
Members of the Union and friends wishing to take the lunch should book by Monday 15th November with Mr B. F. Damper, 3 Beckwith Close, Harrogate HG2 0BJ — Telephone Harrogate 503951.

14.45 hrs Welcome by the Mayor of Harrogate, Councillor Frank Pickles.

15.00 hrs Annual General Meeting of the Yorkshire Naturalists' Union, followed by the Presidential Address by Mr J. R. Mather: *The Development of the Knaresborough Ringing Station.*

At the close of the meeting tea will be served at the nearby Wesley Church Schoolroom by the Harrogate Society.

Car parking may be difficult because of the 'disc system' in use on the streets. Members are advised to use the car parks at the Conference Centre and the multistorage parks in Union Street and in Tower Street.

THE STATUS AND DISTRIBUTION OF THE COMMON SANDPIPER (*ACTITIS HYPOLEUCOS*) IN THE PEAK DISTRICT

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Introduction

The population of Common Sandpipers, *Actitis hypoleucos*, which breeds in the Peak District of England is almost isolated from other breeding populations, and occupies the south-eastern edge of the breeding distribution of the species in this country (Sharrock, 1976). There has been no previous attempt to document its range or status in the Peak District, nor has the species been studied extensively elsewhere; Cuthbertson *et al.*, (1952) in north Yorkshire and Cowper (1973) in Midlothian, Scotland, are the previous studies. This paper reports on its status and distribution, and attempts to specify its habitat requirements.

Methods

Common Sandpipers have a short breeding season; most do not arrive until mid-April, and they leave by mid-July. Only in May and June, when they are settled in their territories, is it possible to study the breeding distribution. During the breeding seasons of 1977–1980, members of the South Pennine Ringing Group (including P.K.H. and J.E.R.) undertook an intensive study of the breeding population in the valleys of the Rivers Alport and Ashop.

Concurrently, an attempt was made (by D.W.Y.) to examine all other potential breeding sites, in order to enumerate the overall population of the Peak District, and establish the habit preferences of the species. This examination was necessarily more cursory. However, Common Sandpipers are demonstrative birds and, as Cuthbertson *et al.* (1952) remark, are reluctant to leave their territory. In late June, when they have newly-hatched young, they are particularly vocal and stay in close attendance, so that census work then is especially valuable.

The brevity of the breeding season made it difficult to cover the whole area, and information supplied by other observers has been most gratefully used. In the west, the Goyt Valley was surveyed by G. Howe, while in the east, members of the Sheffield Bird Study Group censused stretches of the Rivers Wye, Noe and Derwent for the Waterways Bird Survey organized by the British Trust for Ornithology (W.B.S./B.T.O.).

The distribution of this wader might be explained by the distribution of appropriate food supplies, and some observations on food availability and diet are included.

For the purposes of this study, the Peak District encompasses the National Park and ecologically contiguous areas around it.

Results

Status and distribution

The combined total from these surveys is 206 breeding territories (Table 1). However, certain territories occupied in one year are known to have been vacant in subsequent years. This is most obvious for the plots covered by the Waterways Bird Survey, where a total of 15 territories are recorded, although the highest population in any one year was 11 pairs. A more modest total of 193 pairs is the best estimate of the Peak District breeding population in any one year.

General distribution

The number of pairs in each square kilometre is shown in Fig 1. Common Sandpipers are extremely scarce in the limestone areas of the southern Peak District. On the River Wye, 1–3 pairs breed in the Monsal Dale area, certainly in the limestone, while one (former) territory on the River Dove and two on the Manifold were at the junction of the limestone and gritstone

areas. The River Noe and the stretch of the River Derwent downstream from Bamford, with 18 territories, run through gritstone country, but receive some of their drainage from the limestone and cannot therefore be strictly regarded as gritstone rivers. The remaining 182 territories are in gritstone areas, but the majority, 128, were on the reservoirs rather than streams or rivers. The Derwentdale reservoirs held 30 (1979) to 36 (1980) pairs, mostly on Ladybower (24) and Derwent (10) Reservoirs with, in 1980, only 2 pairs on Howden Reservoir. The reservoirs in Longdendale hold 14 pairs, with a further 23 pairs on the various smaller reservoirs and streams

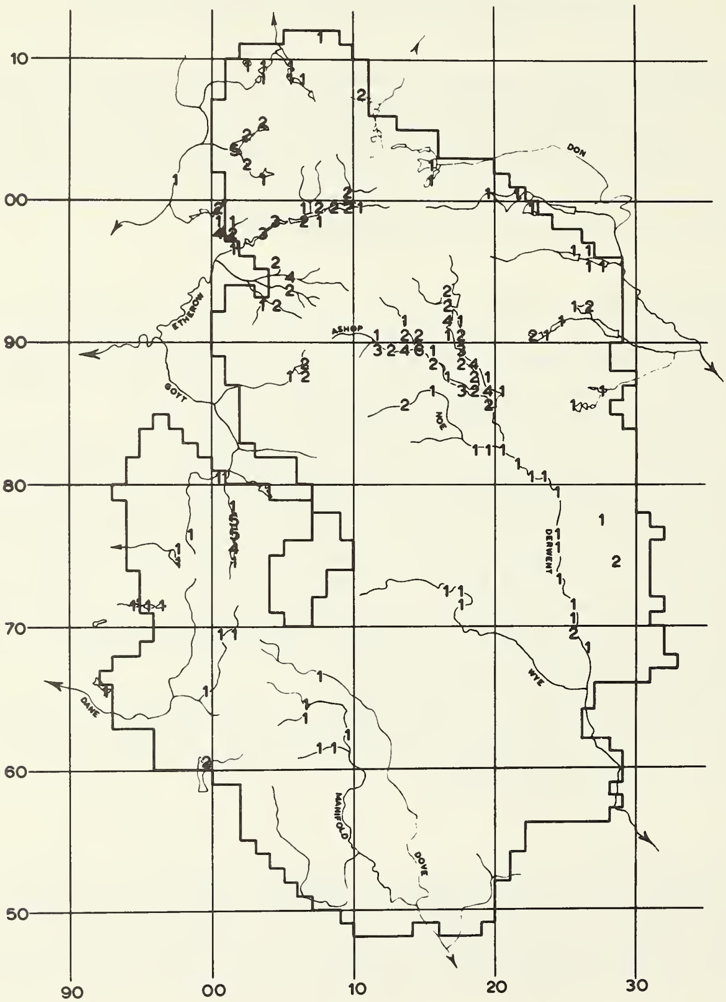

FIGURE 1

Distribution of Breeding Common Sandpipers *Actitis hypoleucos* in the Peak District. Numbers indicate the number of breeding pairs in each 1 km square of the National Grid; the graticule indicates the 10 km grid squares, and the heavy outline shows the boundary of the Peak District National Park.

TABLE 1

Distribution of Common Sandpiper *Actitis hypoleucos* territories in the Peak District

	Reservoirs	Rivers	Total
Derbyshire	77	59	136
Cheshire	6	4	10
Staffordshire	2	6	8
West Yorkshire	9	0	9
South Yorkshire	18	1	19
Greater Manchester	16	8	24
Total	128	78	206

in the neighbourhood of Glossop. The reservoirs in the Goyt valley represent another stronghold, with 13 pairs, and 2 more pairs on the River Goyt itself. The smaller reservoirs along the Yorkshire border of the Peak District hold 26 pairs between them.

The major riverine population inhabits the Ashop and its tributary the Alport; 24 pairs inhabit this stretch. No other gritstone river is unaltered for a sufficient distance to accommodate more than 4 pairs.

Comital distribution

The distribution by (post-1974) counties is shown in Table 1. The overwhelming majority of the population, 136 pairs, is in Derbyshire; 77 of them are on reservoirs. The population in Staffordshire is marginal, with only 8 territories recorded, and 5 of them probably vacant in 1980. The population in Cheshire is, with the transfer of Longdendale, also very small, at 10 pairs, but more secure; like the population in West Yorkshire, also a small one of 9 pairs, most are on reservoirs. Both South Yorkshire and Greater Manchester have populations of around 20 pairs.

Distribution with respect to gradient

The areas inhabited by Common Sandpipers are most easily characterized by the presence, during the breeding season, of shingle banks. These are not found in the higher reaches of the streams, where winter spates wash away finer gravel, neither are they found very often in the lower stretches where sand and mud accrete. They, and the birds, ought therefore to be typical of particular gradients. This has been examined by documenting, for each 1 km National Grid square in which Sandpipers were found, the upper and lower contour on the 1:25,000 Ordnance Survey map, and measuring, with a map measurer, the length of river between those contours on the same map. The gradients have been expressed as metres drop per kilometre of river.

Sandpipers in the Peak District breed on rivers with a wide range of gradients, from 2 m/km on the lower reaches of the River Derwent to 69 m/km on Chew Brook, Saddleworth. However, only three occupied stretches of river had a gradient over 50 m/km and these were all immediately adjacent to reservoirs whose shores could have been the principal habitat of these birds. There were eleven territories on rivers with gradients of 30 m/km or more, and several of those were well away from reservoirs. The well-populated stretch of the River Ashop has, averaged over a length of 7.5 km, a fall of 13 m/km, while the populated stretch of the River Alport has a fall of 21 m/km. The very low gradient, 2.1 m/km averaged over a stretch of 17.9 km, for the length of River Derwent surveyed for the Waterways Bird Survey (Marchant & Hyde 1980) is certainly not typical of the Peak District as a whole. If the figure has any real meaning, the average fall for a riverine Common Sandpiper territory in the Peak District is 17.8 m/km (S.D. 15.6, n = 78).

For most territories, of course, those on reservoirs, the gradient is zero. However, several observers have remarked on the barren shores of Peak District reservoirs, consequent upon their

steep sides and the sharp drop of water level which usually occurs in summer; the observation usually qualifies a complaint about the poor duck populations that these reservoirs hold, but it is the same lack of vegetation that makes them suitable for Common Sandpipers.

Altitudinal distribution

The highest riverine territories are two on the River Dane at 370 to 425 m (1200 — 1400 ft), but no other riverine territories are above 305 m (1000 ft). There are several reservoirs in the north of the Peak District at over 305 m, (Redbrook, Black Moss and Swellands Reservoirs) and each has a pair of Sandpipers. Elsewhere Lamaload, Redmires and Barbrook Reservoirs are also above 305 m. The highest reservoir in the Peak District is Chew, at 488 m (1600 ft), and Sandpipers are regularly present, presumed breeding, there in the breeding season. However, the mean altitude of a breeding territory is much lower than these exceptional records, at about 230 m (S.D. 59 m) (756 ft ± 193 ft).

Density

Any discussion of the density of Common Sandpipers has to be qualified by a careful pronouncement of the area or distance to which the density applies. The population recorded here occupies, in part at least, 18 ten-kilometre squares of the National Grid; for comparison, then, with Sharrock (1976), a density of 11 pairs per grid square (11 pairs per 100 km^2) has some relevance. Sharrock (1976) used the extreme values of 10 and 30 pairs per 10 km square to estimate the size of the British population.

TABLE 2

Density estimates for principal strongholds of the Common Sandpiper *Actitis hypoleucos* in the Peak District

Site	Length Surveyed	No. Territories	Density
Rivers Noe & Derwent	17.9 km	13	0.7 prs/km
Rivers Ashop & Alport	10.05	24	2.39
Ladybower Reservoir	18.9	24	1.27
Derwent Reservoir	6.7	10	1.49
Goyt Reservoirs	7.6	15	1.97
Longdendale Reservoirs	18.8	14	0.74

For a bird of such linear habitat, the density per kilometre of river or reservoir shore is a more useful statistic. For the best stretches (Table 2) densities between 0.7 and 2.4 pairs/km of river or shore apply. Overall, the total length of river surveyed (not all of it suitable habitat) was 136 km, giving an average of 0.57 prs/km, and the 175 km of reservoir shore had 0.73 prs/km.

Distribution in relation to disturbance

The absence of breeding Sandpipers from Damflask and Underbank Reservoirs is felt to be due to the considerable pressure these receive from anglers. Both have well-worn shore-line paths, and spot counts of anglers on Damflask revealed 24 at 17.00 hours on 12 June 1980, a weekday, and 46 at 18.30 hrs on 24 August 1980, a Saturday; the latter represent 8.6 anglers per km of shore. Coarse angling is probably a more severe pressure than fly fishing, for coarse angling can be done from any suitable piece of shore, whereas fly fishermen require a clear area behind them in order to cast the fly. Any stretch where trees and bushes come down to the waterside is therefore protected from their use.

In 1979 the effect of this on the Common Sandpipers around the Ladybower Reservoir was very clear. Of the 18 certain territories that year, 9 were centred just inside the edge of wooded areas adjoining open (angling) beaches, 6 were on steep, wooded shores or by inlets which were not attractive angling beaches, and only 3 were alongside open angling beaches with no waterside tree cover; in these 3, however, the nests were well back from the water's edge in the forestry plantations, up to 70 m from the shore-line. In 1980, the pattern was not quite so clear, because the water level was 2.5 m lower, and allowed anglers access to beaches which in 1979 (and perhaps earlier in the 1980 breeding season) had been secluded. Even so, the general distribution of territories in respect to cover and angling pressure was very similar (Fig 2). It is perhaps fortunate that the large size of Ladybower Reservoir (18.9 km of shoreline), the fact that the shore is not, generally speaking, open to the public, and the provision of routes around the reservoir which are set back from the shore, have combined to keep the shore reasonably free of regular pedestrian along-shore traffic. The contrast between Errwood Reservoir (fishing and sailing) with 3 pairs, and Fernilee Reservoir (11 pairs) in the Goyt valley is also notable.

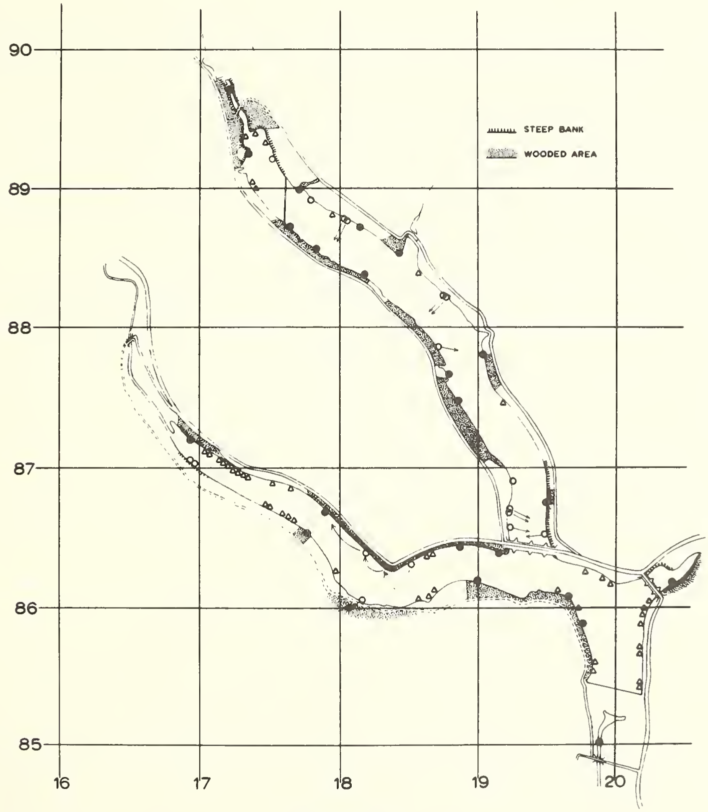

FIGURE 2

Distribution of 23 breeding territories (●) and 17 feeding Common Sandpipers (○) around the Ladybower Reservoir, 21 June 1980. The distribution on that day of 45 shore-based anglers is also shown (△) (there were another 8 anglers fishing from boats). The presence of steep banks and woodland cover reaching the shoreline, both of which offer some protection to the birds from disturbance, are also shown. (The graticule shows 1 km squares of the National Grid.)

It is probable that the high riverine population along the Alport and Ashop Rivers is also correlated with their privacy, and the absence of riverside footpaths. It is notable that the one stretch of the River Ashop which has a riverside footpath, near the confluence with Lady Clough, has never had any Sandpiper territories. As well as having a well used footpath, the start of the Snake Path, the area is a popular picnic spot. In other respects (gradient, nest cover, presence of shingle banks, food supply), the area seems entirely suitable. The areas which are censused for the Waterways Bird Survey also suffer from the disturbance of riverside footpaths and there is some suggestion that the number of territories has declined since those paths were publicized in an Automobile Association publication (Moore, 1976). Unfortunately, the population of Sandpipers along these stretches is too small for a confident demonstration of this point.

Diet

Food availability

Superficial observations show Common Sandpipers feeding in the shallow margins of rivers and reservoirs in stony areas, and one would expect that aquatic insect larvae, especially of Ephemeroptera, Trichoptera and Plecoptera, supply much of the diet. To investigate their availability, four 'shuffle-samples', were taken in May, June and July, 1980. Each sample involved shuffling the stones and gravel upstream of a pond net for five minutes. The material was preserved in 70 per cent alcohol with 5 per cent glycerol. The four samples for each month have been combined for presentation in Table 3. To convert these numbers to biomass, a sample of 20 individuals of each of the main prey groups was weighed, after gently drying off the alcohol. The results suggest that prey reaches a maximum during the breeding season, both in

TABLE 3

Potential food of Common Sandpipers on the River Ashop. Each value is the total of four shuffle-samples, each of five minutes. (Mean prey weights, mg, in brackets; for minor elements, 2 mg was taken as the weight.)

		Date	
Numbers	11.v.80	7.vi.80	15.vii.80
Ephemeroptera larvae	4	779 (3.5 mg)	234 (4.4 mg)
Plecoptera larvae	691 (1.9 mg)	242 (2.4 mg)	94 (0.9 mg)
Trichoptera larvae	17	26	2
Other	25	30	47
Total	737	1077	377

		Date	
Biomass (g)	11.v.80	7.vi.80	15.vii.80
Ephemeroptera larvae	0.014	2.734	1.020
Plecoptera larvae	1.326	0.581	0.087
Trichoptera larvae	0.034	0.052	0.004
Other	0.05	0.06	0.094
Total	1.414 g	3.427 g	1.205 g

TABLE 4

Diet analysis, of 13 specimens of faeces or (No. 13) a pellet. Sample 6 is from a chick. ad — adult; l — larva.

Sample	Carabid ad.	Carabid l.	Elaterid ad.	Elaterid l.	Curculionid ad.	Staphylinid ad.	Cantharid l.	Silphid ad.	Formicid	Lepidoptera l.	Hemiptera	Hymenoptera ad.	Tipulid l.	Diptera ad.	Araneae	Lumbricid	Trichoptera ad.	Trichoptera l.	Plecoptera l.	Date
1	+	−	−	−	−	−	−	−	−	+	−	−	−	−	−	−	+	−	−	6.v.79
2	+	−	+	+	+	−	−	−	−	+	−	−	+	−	−	++	−	−	−	7.v.79
3	−	−	−	−	+	−	−	−	−	−	?	−	−	−	−	−	++	−	−	19.v.79
4	−	−	−	−	−	+	−	−	−	−	?	−	−	−	−	−	++	−	−	1.v.79
5	++	−	+	−	+	−	−	−	−	−	−	+	−	−	−	−	−	−	−	12.vi.79
6	+	+	+	−	+	+	+	−	+	−	−	+	−	+	+	−	+	−	−	12.vi.79
7	+	+	−	−	−	−	−	−	+	−	−	+	−	+	−	−	−	−	−	5.vii.79
8	+	+	−	−	+	−	−	−	−	−	−	+	−	−	−	+	−	−	+	5.vii.79
9	+	−	−	−	+	−	−	−	−	−	−	−	+	−	−	+	−	−	−	9.v.79
10	+	+	−	−	−	−	−	−	−	−	−	−	−	−	−	+	−	++	−	?.vi.80
11	−	+	−	−	−	−	−	−	−	−	−	−	+	−	−	++	−	−	−	22.vi.80
12	−	−	−	−	−	−	−	−	−	?	−	−	−	−	−	−	−	−	+	22.v.80
13	+	−	++	−	+	−	−	+	−	−	−	−	−	−	+	−	−	−	−	14.vi.79
Total occurrences	9	5	4	1	7	2	1	1	2	3?	2?	4	3	2	2	5	4	1	2	

numbers and biomass, in June; subsequently, the emergence of the adult insects reduces prey numbers and also, since the heaviest larvae are those which metamorphose, reduces the biomass of potential prey.

Diet

To investigate whether these samples in fact reflect food availability, droppings and pellets were collected, both in the field and from the bird bags used during ringing to hold the birds temporarily. In fact, only 13 samples were obtained, and only one was a pellet; only one collection of faeces came from a chick. The samples were mounted in a water-soluble mountant ('Hydramount', Gurr) on microscope slides as semi-permanent mounts.

The results suggest that, in fact, aquatic prey are not expecially important to Common Sandpipers (Table 4). Sixty prey occurrences included 53 which one would regard as terrestrial invertebrates, and only 7 of essentially aquatic prey. Earthworms, carabid and elaterid beetles, weevils, caterpillars and ants were among the terrestrial prey; adult and larval caddis-flies and larval stone-flies were the aquatic prey. This method of scoring may underestimate the aquatic prey to some extent; for example, the occurences of caddis flies included little else.

Common Sandpipers are, in fact, often seen feeding in pasture away from the water margins, and have been observed taking earthworms (of 63 observations of feeding birds in April and May, only 23 were at the water's edge, 40 were in grass or flushes). Possibly, then this faecal analysis reflects more accurately the actual diet of these birds than do our preconceptions.

Alternatively, our preconceptions may be correct, but faecal analysis is heavily biassed against the thinner, less robust and less obvious, aquatic larvae; the failure to detect any may-fly larval remains in the faeces is especially striking. Conversely, a single beetle leg is very conspicuous on a slide. Lastly, it is possible that in fact the newly hatched chicks rely on aquatic foods though adults do not; however, even pulli appear to spend much time feeding among rushes and in coarse vegetation near the streams. Clearly, this is a topic which requires much more investigation.

Discussion

This study raises areas for discussion. Within the local, Peak District, context, the importance of these results for the conservation of the species in an area subject to intense recreational disturbance and other pressures needs consideration, and the relationship between the distribution of the Common Sandpiper and the Dipper *Cinclus cinclus* is interesting. A comparison of our results on distribution and status with those elsewhere in Britain is also necessary. Above all, the strengths and shortcomings of our own results require some examination.

Significant results and outstanding problems

We suggest that 193 pairs of Common Sandpipers breed each year in the Peak District, 60 per cent of them having territories on upland reservoirs, and 40 per cent on streams and rivers. They are principally found in acid, gritstone areas, and seem to prefer shorelines, of both streams and reservoirs, which are gravelly with little or no vegetation cover. On streams, such shorelines are probably the result of a particular gradient and typical of a particular altitudinal range; in the Peak District, territories certainly occurred on rivers with gradients between 2 m/km and 33 m/km, and perhaps up to gradients as high as 58 m/km, and in an altitudinal range of 225–425 m (700–1400 ft). Sandpipers are often seen foraging along the stony margins of streams and reservoirs, and it is logical to presume that it is the food supply which produces their habitat preference. 'Shuffle-sampling' of one riverside indicated that mayfly and stonefly larvae would provide an abundant and appropriate food supply, but a limited amount of diet analysis did not confirm these as important items of diet. We do not know whether the diet analysis was inadequate or misleading, or whether perhaps the aquatic food supply is in fact of paramount importance, but primarily to the chicks during their flightless growth stages; we did not sample chick diets adequately.

Comparisons with other studies

The description of breeding habitat by Cuthbertson *et al.* (1952) accords well with our experience; they too note an avoidance of limestone areas, of gradients greater than 38 m/km (220 ft per mile) and of densely vegetated banks. The density overall in their study, 101 pairs in 96 km (60 miles), or 1.05 prs/km, is higher than our overall figures of 0.57 prs/km of river or 0.73 prs/km of reservoir shore, but these latter figures include many stretches of unfavourable habitat; the figures of 0.7–2.4 prs/km of occupied shore or river are obviously similar to their figure. Cuthbertson *et al.* (1952) and Cowper (1973) suggested a degree of population stability which has been confirmed by the Waterways Bird Survey (W.B.S.) (Marchant & Hyde 1979); over four years 1974–78, populations varied only from −5 per cent to + 3 per cent. This accords well with our own experience, and has the important correlate that our census, accumulated over four years, should be a valid assessment of the total population of the Peak District; this would not be the case if the population size fluctuated markedly from year to year.

A major difference between our results and those of either Cuthbertson *et al.* (1952) or the W.B.S. (Marchant & Hyde, 1980) is the large proportion of our population inhabiting reservoirs; the W.B.S. was intended for use on linear waterways, but this inevitably means that large bodies of still water (reservoirs, lakes, gravel pits) have been left out of the various census schemes. Cowper (1973) remarks that most Sandpipers in his area held territories on reservoirs, but does not give separate figures. So far as W.B.S. plots are concerned, the recorded densities (at best 0.9 prs/km, mostly around 0.3 prs/km) for Common Sandpipers seem low, and the

apparent preferred gradient of between 2.5 and 5 m/km (Marchant & Hyde, 1980) is much lower than the preferred gradients in the Peak District. The W.B.S. plots do not seem to be sampling good Common Sandpiper habitats.

Comparison with Dipper

The national distribution maps for Dipper *Cinclus cinclus* and Common Sandpiper look very similar (Sharrock 1976); at a first approximation, both are birds of hill streams. Their breeding populations in the Peak District are a similar size; Shooter (1970) suggested that the Dipper population of Derbyshire was around 107 pairs, and one would guess that the other counties hold around 50 pairs. In detail, however, the distributions are rather different. The strongholds of the Dipper are the limestone rivers (Wye, Dove, Manifold) and the lower stretches of the gritstone rivers; the Dove from Brand to Hartington has 10 Dipper territories, but only 1 (former) Sandpiper territory, while the Derwent from Bamford from Baslow regularly has 17 Dipper territories but, at most, 13 Sandpiper territories. Conversely, the reservoirs, strongholds for the Sandpiper, do not provide suitable habitat for Dippers, and in the higher reaches of the gritstone rivers, Dippers are outnumbered; on the Ashop and Alport, with 24± 2 Sandpiper territories, there are only 4 Dipper territories, all in deeper stretches where Sandpipers are missing.

Conservation

Though there has been no previous attempt to census the local breeding population of Common Sandpipers, there seems to be general agreement that it has declined; at least, there has been a retreat from the surrounding lowlands. In Cheshire, Coward and Oldham (1900) list a number of lowland breeding sites where it no longer occurs, and Bell (1962) said that it bred on several meres. Later, however he said (Bell, 1967) that there were no recent breeding records from the meres, though it still bred at Shotton Pools and Sandbach Flashes; the *Atlas* (Sharrock, 1976) shows a few breeding sites in lowland Cheshire. In Staffordshire and Derbyshire there seems to have been a similar retreat; Smith (1934) and Whitlock (1893) refer to regular breeding sites on the rivers south of the Peak District, but it now appears to be largely confined to the Peak District, and nests only irregularly elsewhere in these counties (Lord & Munns, 1970; Frost, 1978). Bell (1962), referring to the Cheshire meres, and Smith (1934) referring to Dovedale, both suggest that recreational disturbance has been a major factor in these declines; this matches the absence of the species from certain well-frequented reservoirs (eg Damflask and Underbank) in our survey, and the distribution pattern of Sandpipers and angling disturbance around Ladybower Reservoir. Proposals for increased public access to reservoir shores which are at present good Sandpiper sites (Peak National Park, 1979) are disquieting from this viewpoint.

In Staffordshire, at least, there appears to have been a decline in the small breeding population even during the four years of our survey. This seems to be due to a change of habitat; angling interests have constructed small weirs at regular intervals along parts of the upper Dove and on Blake Brook, thus creating a series of deep pools separated by small water-falls. This provides better habitat for game fish, but probably removes the feeding sites for Common Sandpipers.

The conversion of large rivers into a series of major storage reservoirs (the River Etherow into the Longdendale system, and the River Derwent into the Howden-Derwent-Ladybower chain) might be regarded as a similar habitat change. However, these upland reservoirs seem to provide such suitable habitat for Sandpipers that they are unlikely to have suffered from the change, and may even have benefited. The lengths of the Rivers Etherow, Derwent and Ashop drowned by the reservoirs totalled 29 km, and if they had held 1.5 pairs/km, the population pre-reservoirs might have been 44 pairs; in 1980, there were 50 pairs on the reservoirs. It is possible that this comparison is optimistic, since the rivers downstream of the dams may have been affected adversely.

It seems likely, then, that recreational disturbance is the major threat, actual or potential, to the species in the Peak District. This is unlikely to affect adult survival, and probably does not greatly affect hatching success either. Most nests are situated on steep banks, which are difficult to walk along, and in much disturbed areas, Sandpipers will nest well back from the water's edge

and sit tightly. It seems likely that the effect on feeding of fledgling sandpipers is critical. Each chick must gain weight from 8 g to 40 g at fledging in 20 days; all the feeding must be done within walking range of the nest site. We would guess that excessive disturbance at this time is critical, and certainly our evidence (Holland *et al.*, in press) suggests that mortality is high at this time; this is an aspect which deserves more attention. It is possible that re-analysis of the W.B.S. results from this viewpoint would be worthwhile; there may be a contrast between stretches or plots where the observers use public footpaths and those where they have permission to visit more private ground.

Summary

The breeding population of Common Sandpipers in the Peak District is estimated to be 190 — 210 pairs, most probably about 193 pairs. Of these, 78 pairs breed beside rivers and 128 beside reservoirs, mostly in the gritstone areas; only 6 pairs breed in limestone areas. Most of the population, 136 pairs, is in Derbyshire. On the rivers, the average gradient in a territory is 18 m/km, with only 11 territories having gradients greater than 30 m/km. The altitudinal range was 130 — 490 m, $\bar{x} = 230$ m (425-1600 ft, $\bar{x} = 756$ ft). The average density over the whole study area, including unsuitable areas, was 0.57 prs/km of river and 0.73 prs/km of reservoir shore, but favoured areas had densities up to 2.4 prs/km. Sampling for potential food suggested an abundance of stonefly and mayfly larvae in the breeding streams, but it is not clear, from a limited amount of diet analysis, that these are actually major food items.

Acknowledgements

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A COMMON LONG-EARED BAT *PLECOTUS AURITUS*: MOTH PREDATOR — PREY RELATIONSHIP

M. J. A. THOMPSON

Introduction

The common long-eared bat *Plecotus auritus* is widely distributed in Britain, and feeds predominantly on Noctuid moths. Bat diets can be determined by the analysis of stomach contents, faeces or the discarded remains of insects, such as wings, limbs and heads (Ross, 1967). This study from Skelton, near York (Grid Ref 44/569563) was carried out in 1979 and 1980 on the remains of moth wings below a *P. auritus* feeding perch, and the results compared with those of Poulton (1929). The main survey (1980) relates the feeding habits of the bat to climatic and ambient air temperatures and the availability of Noctuid moths in the area, as measured by a portable U.V. lamp trap during the months of June to September.

The Bat and its Habitat

The feeding perch, first located in 1978, was the interior gable end of some old stables. Half the stables was used as a garage, and was closed with main doors. The bat gained access through the open half and the loft space above. Air movements at the perch were minimal. The remains of moth wings were found below the perch, which was used throughout the night, but mostly after 23.00 hours B.S.T. No fresh remains were found after dawn.

After many hours of watching during 1980, the bat was seen on the perch, and positively identified as *P. auritus*. Its large ears were noted in the extended position. Its light, often hovering, flight pattern was observed with the aid of a powerful torch. Using a mini-bat detector (Q.M.C. Instruments), set between 40 and 45 KHz, its echo-locating and faint clicking pulses were audible at one metre range. Tooth marks on moth wings confirmed the identification of *P. auritus* (Stebbings, 1979, *pers. comm.).*

Within the vicinity of the stables are a number of domestic kitchen gardens, bounded by low cut hedges. The dominant plants under cultivation were *Brassica* spp.; a small orchard. *P. auritus* was observed feeding in both habitats, and in the loft space of the stables. The bat emerged to feed from an unknown roost after dark. Its direct flight to the perch only occurred when the garage doors were closed. This perch was not used in 1981.

Methods and Materials

Remains of moth wings were collected from below the gable end, from 6 June, 1980, when the bat first started using the perch, until 1 October. Similar collections were made from mid-August to mid-September 1979. During June 1980, the remains were collected on a weekly basis, but from 3 July until 1 October, they were collected daily. Other insect remains were also removed for identification.

To avoid duplication the wings were paired up each week. To estimate the counting error, special care with the wings of the less common moths was taken. Of forty-one less common moths, four were identified with half wings only, indicating a possible over-estimation in numbers of about 10 per cent. Poulton (1929) found a tendency to under-estimate his numbers.

Most moths were identified by the author, but those which were more difficult to name were referred to Dr Michael Usher of the Department of Biology, York University.

Ambient air temperatures, Beaufort wind speeds and cloud and rain conditions were all obtained from the local Meteorological Office at R.A.F. Linton-on-Ouse, 9 km north-west of Skelton. Both Skelton and Linton are at the same altitude (15 metres a.s.l.) in the Vale of York. Weather conditions were noted at 22.00 hours and recorded on a daily basis for July and August, and generally noted for the other summer months. Information on cloud and rain conditions was not always available at weekends.

Sampling of the moths in the area was carried out through those months at weekends. A portable light trap, operated on mains electricity, was set 400 yards from the perch. The light, a 6 watt 9″ actinic 5 lamp, was run from dusk until dawn. The moths were identified the following

day and released in the evening. Special care was taken to identify the Noctuidae, Arctiidae and Geometridae, to see how selective the bat was with these Families. Pyrahalidae were not identified.

At the beginning of October 1980, evidence of another feeding perch was found at the other gable end of the same building, but few remains were found.

TABLE 1

Comparisons between surveys of prey items — Sheffield (1921), Oxford (1929), Skelton (1979) and Skelton (1980), with monthly totals given for 1980. Each figure is a percentage of the total number of moths taken at that site. Sheffield and Oxford from Poulton (1929).

					1980		1980	
Date	1921	1929	1979	1980	June	July	Aug	Sept
Total No. in Sample (n)	799	531	160	809	47	220	421	120
Noctuidae:								
1 Lesser Broad-border *E. janthina* Schiff.	3.8	3.8	—	0.6	—	—	1.2	—
2 Lesser Yellow Underwing *E. comes* Hubn.	6.5	7.3	26.8	10.9	2.1	5.0	16.9	4.2
3 Large Yellow Underwing *N. pronuba* Linn.	22.9	33.5	16.8	33.8	10.6	43.3	28.5	13.3
4 Cabbage Moth *M. brassicae* Linn.	5.3	4.0	20.6	9.8	21.2	16.4	7.6	0.8
5 Bright-line Brown-eye *D. oleracea* Linn.	0.3	3.8	—	1.4	4.3	2.9	0.7	—
6 Mouse *A. tragopoginis* Clerck.	4.9	8.3	1.9	—	—	—	—	—
7 Dark Arches *A. monoglypha* Hufn.	26.4	13.4	6.9	6.7	2.1	11.8	5.7	2.5
8 Clouded-bordered Brindle *A. crenata* Hufn.	2.7	—	0.6	0.1	2.1	—	—	—
9 Rustic Shoulder-knot *A. sordens* Hufn.	3.1	0.6	—	0.4	4.3	0.5	—	—
10 Dusky Brocade *A. remissa* Hubn.	2.4	0.9	—	0.2	—	0.9	—	—
11 Common Rustic *A. secalis* Linn.	9.9	5.5	5.6	9.8	4.3	—	15.2	10.8
12 Pale Mottled Willow *C. clavipalpis* Scop.	4.9	0.2	—	—	—	—	—	—
13 Silver Y *P. gamma* Linn.	1.1	4.1	10.0	18.0	6.4	3.2	16.2	57.5
Arctiidae:								
14 Buff Ermine *S. lutea* Hufn.	—	1.5	2.5	1.1	14.8	0.9	—	—
Geometridae:								
15 Garden Carpet *X. fluctuata* Linn.	1.9	0.9	—	—	—	—	—	—

Results

All moths are classified in Tables according to the system of Edelsten and Fletcher, used by South (1961).

Table 1 compares the more common prey items of the British surveys. The fifteen species selected have more than seven prey items of that species in at least one sample. The Skelton 1980 survey shows that the Large Yellow Underwing *N. pronuba* is the moth of choice, with numbers peaking in July, although a large number were caught in August. This moth, the largest taken by *P. auritus*, exhibits sexual dimorphism, and no attempt was made to differentiate between the sexes taken as prey items. According to W. D. Featherby *(pers. comm.)*, *N. pronuba* appeared late on the wing in Yorkshire in 1980 because of wet weather conditions. On several occasions *N. pronuba*, with its erratic flight path, was noted to be flying in the loft space. The bat was observed once in pursuit of this moth, with the moth taking avoiding action. The terminal 'zipp' of the bat's echo-location was easily audible, when both were within a metre's range. The bat eventually took the moth from below; also noted by Inchbald (1825). *N. pronuba* was taken throughout the night, as remains were found at various times. When *N. pronuba* became less available as a prey item, then *P. auritus* turned to other moths and insects, such as the Common Rustic *A. secalis*, Lesser Yellow Underwing *E. comes* and Silver Y *P. gamma*.

The migratory moth *P. gamma* appeared in the U.V. trap on 16 August, and from that day onwards the bat took this species most days, so that by September this moth was the dominant dietary item, making up 57.5 per cent of the catch for the month. The only other Plusiinae taken by the bat was Burnished Brass *P. chrysitis* in small numbers from June to August.

Of the Arctiidae, Buff Ermine *S. lutea* only makes up 1.1 per cent of the total catch for 1980. Of these the majority were taken in June, when other moths were not available. U.V. trap results show that both *S. lutea* and White Ermine *S. lubricipeda* were present around Skelton, especially *S. lutea* in June.

An unpalatable Arctiidae moth found at the perch on a single occasion in 1979 was Garden Tiger *A. caja*. This female moth was completely untouched by the bat, except for tooth marks deeply embedded in the thorax. Two specimens were caught around midnight during August 1980 in the U.V. trap.

Table 2 indicates that one Hepialidae moth was found at the perch in 1980, a male Ghost Moth *H. humuli* taken in June. Direct comparisons between the 1979 and 1980 Skelton surveys are

TABLE 2

Comparisons of other *P. auritus* — moth prey items between Britain and Europe; Sheffield and Oxford from Poulton (1929), Neschwitz and Eifel from Roer (1969)

Site	Sheffield	Oxford	Neschwitz	Eifel	Skelton	Skelton
Date	1921	1929	1956	1969	1979	1980
Moth Totals	799	531	273	37	160	809
Species Totals	24	46	29	17	18	48
Family Totals						
Notodontidae	—	1	—	—	—	—
Thyatiridae	—	—	—	1	1	3
Noctuidae	20	37	29	15	13	41
Arctiidae	—	2	—	—	2	1
Geometridae	3	5	—	—	2	2
Hepialidae	1	1	—	1	—	1

TABLE 3

Comparisons between Noctuidae, Arctiidae and Geometridae moths trapped over 12 nights in U.V. trap and those same Families taken by *P. auritus* over the same nights

	Noctuidae	Arctiidae	Geometridae
U.V. Trap			
n = 241	58.9%	12.0%	26.6%
P. auritus			
n = 119	94.1%	4.2%	1.7%

difficult, but both show that Geometridae were infrequent prey items. Except for Garden Carpet *X. fluctuata*, all belonged to the sub-family Ennominae.

Comparisons are made in Table 2 between the two Skelton surveys and those carried out elsewhere in Britain and Europe. Of the other British surveys all listed by Poulton (1929), only that of Whitaker from Sheffield (1921) is directly comparable with those of Skelton, especially for 1980 (see discussion). Both have large samples, although Skelton has a wider range of moth species. In all, from the two Skelton surveys, fifty-one species of moth have been identified in the district from the winged remains. One species, Copper Underwing *A. berbera*, taken by the bat in September, is a new county record. *A. berbera* was recognized and separated from Copper Underwing *A. pyramidea* as a distinct species in 1967 (Heath, 1971). Another moth, also in the sample, Figure of Eighty *T. ocularis* is near its northern limit in this part of Yorkshire.

Table 3 indicates that although noctuid moths make up 58.9 per cent of the trappable moths within the district, the bat was feeding selectively on this family only. Geometridae, probably because they have less food value and some are diurnal fliers, were avoided by the bat. Arctiidae were taken in limited numbers, but generally avoided, presumably because they are distasteful.

Comparing the percentages of the six most common species of moth taken by *P. auritus*, with those same species trapped on twelve trap nights shown in Table 4, indicates that only in two species, *N. pronuba* and *E. comes*, is there a correspondence between the noctuids availability and those taken by the bat. The remaining four species appear to be selected by the bat, but this may be because these moths are trap shy. The Cabbage Moth *M. brassicae* was probably taken in larger numbers by the bat, in spite of small numbers in the U.V. trap, because the feeding perch was next to the kitchen garden.

Figure 1, a fitted linear regression, compares the number of noctuid moths trapped in the U.V. trap with those taken by the bat over the same twelve nights. The co-efficient of determination equals 0.24, indicating that only 25 per cent of the variation in bat catches is explained by changes in noctuid numbers. The probability of exceeding the F. value equals 0.10, indicating that the probability of exceeding such a relationship by chance is about 1 in 10 (normal

TABLE 4

Comparisons between common Noctuidae available on 12 U.V. trap nights, and those same species taken by *P. auritus*, over the same nights

Species	Percentage taken by bat	Percentage in U.V. trap
1 *N. pronuba*	27.7%	29.5%
2 *E comes*	10.7%	11.3%
3 *P. gamma*	7.1%	4.2%
4 *M. brassicae*	15.1%	3.5%
5 *A. secalis*	15.2%	1.3%
6 *A. monoglypha*	7.4%	4.2%

TABLE 5

JULY 1980

Species listed in bat preference order. Other species are shown below, with totals for each species, bracketed

Date	1	2	3	4*	5*	6	7	8	9	10	11*	12*	13	14	15	16	17	18*	19*	20	21	22	23	24	25*	26*	27	28	29	30	31	
Weather	C	BC	C	—	—	—	C	C	B	B	—	—	—	B	C	C	D	R	B	—	BC	C	BC	BC	—	—	—	C	CD	C	C	
Temperature	12	15	16	—	—	—	13	13	11	11	12	11	12	11	11	—	14	13	13	9	12	17	15	15	17	17	19	17	15	17	17	
Wind	4	1	0	2	1	1	1	4	3	1	1	2	3	2	2	2	3	4	3	3	0	2	3	2	3	1	2	2	3	2	1	
SPECIES																																TOTALS
N. pronuba	—	—	5	5	3	1	2	4	4	3	1	3	2	3	2	1	3	3	1	4	3	5	4	5	4	9	2	2	4	5	3	96
M. brassicae	—	—	3	3	3	2	1	2	2	2	2	1	1	1	—	—	2	—	—	—	1	1	2	2	1	1	—	—	—	2	1	36
A. monoglypha	—	—	—	3	2	1	—	1	—	—	2	1	1	—	—	—	—	—	—	—	—	—	1	2	1	1	3	—	3	2	2	26
E. comes	—	—	—	—	—	1	—	—	1	—	—	2	1	1	—	1	8	8	8	8	2	1	—	—	—	—	—	—	—	1	—	11
P. gamma	—	—	—	1	—	—	—	2	1	—	—	—	1	—	1	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	7
Other species†	—	—	—	6	6	1	—	2	3	2	—	—	1	1	1	—	2	—	—	—	1	—	1	3	1	2	—	—	3	4	3	44
Daily totals	—	—	8	18	14	6	3	11	11	7	5	7	7	6	4	2	7	3	1	4	7	6	9	12	7	14	5	2	10	14	10	220

† Other species *L. pallens* Linn. (6); *D. oleracea* Linn. (6); *M. persicariae* Linn. (3); *A. lithoxylaea* Schiff. (3); *E. orbona* Hufn. (3); *A. exclamationis* Linn. (3); *S. lutea* Hufn. (2); *C. elinguaria* Linn. (2); *N. typica* Linn. (2); *A. remissa* Hubn. (2); *U. triplasia* Linn. (1); *T. ocularis* Linn. (1); *A. sordens* Hufn. (1); *A. epomidion* Haw. (1); *T. batis* Linn. (1); *P. meticulosa* Linn. (1); *A. unanimis* Hubn. (1); *P. chrysitis* Linn. (1); *E. lucipara* Linn. (1); *H. pyritoides* Hufn. (1); *L. lythargyria* Esp. (1).

Weather key R = rain; RR = heavy rain; C = cloudy; BC = partly cloudy; B = clear; D = drizzle; T = thunder.
Temperature °C. Wind — Beaufort Scale. Time — 22.00 hrs.

*Weekend weather unrecorded at R.A.F. Linton-on-Ouse.

TABLE 6

AUGUST 1980

Species listed in bat preference order. Other species are shown below, with totals for each species, bracketed.

Date	1	2*	3*	4	5	6	7	8	9*	10*	11	12	13	14	15	16*	17*	18	19	20	21	22	23*	24*	25	26	27	28	29	30*	31*	
Weather	RR	RR	—	BC	C	DC	C	RR	B	—	CR	C	B	CT	RR	B	—	C	C	—	B	—	B	B	—	C	—	—	—	—	—	
Temperature	13	15	17	17	15	15	13	12	13	16	15	13	20	18	17	17	16	15	14	17	11	12	11	11	13	13	16	13	13	10	11	
Wind	1	3	1	2	3	1	3	1	1	1	2	1	2	2	2	3	2	3	2	3	1	2	1	1	2	2	1	2	1	1	2	
SPECIES																																TOTALS
N. pronuba	3	3	4	8	7	5	9	1	6	6	6	4	4	3	2	7	4	7	2	2	3	4	6	2	3	1	3	4	1	—	—	120
E. comes	1	—	1	2	1	1	4	1	2	2	3	3	4	3	2	6	6	5	2	—	1	2	2	1	1	3	—	3	3	3	3	71
P. gamma	—	—	—	—	—	—	—	—	—	—	—	—	—	—	—	1	3	6	3	—	—	4	4	1	3	3	8	14	11	4	3	68
A. secalis	1	3	1	3	1	—	—	—	—	—	1	5	—	7	—	6	15	6	2	2	3	1	2	1	—	1	1	1	—	—	1	64
M. brassicae	1	4	1	2	2	—	1	2	—	2	1	—	2	—	2	2	2	1	—	—	1	—	2	—	—	—	—	2	1	1	—	32
A. monoglypha	—	1	2	2	2	2	—	2	2	1	—	1	—	—	—	2	1	1	—	—	—	1	3	—	—	1	—	—	—	—	—	24
Other species†	1	2	2	—	1	—	1	1	1	—	2	2	—	3	—	—	8	3	2	—	5	—	2	—	—	1	1	3	—	—	—	42
Daily totals	7	13	11	17	14	8	15	7	11	11	13	15	10	16	6	24	39	29	11	4	13	12	21	5	7	10	13	27	16	9	7	421

† Other species *H. proboscidalis* Linn. (6); *E. janthina* Schiff. (5); *L. pallens* Linn. (4); *E. biundulata* de Vill. (4); *D. oleracea* Linn. (3); *E. orbona* Hufn. (2); *A. chi* Linn. (2); *A. psi* Linn. (2); *E. lucipara* Linn. (2); *S. libatrix* Linn. (2); *E. nigricans* Linn. (1); *N. typica* Linn. (1); *M. persicariae* Linn. (1); *C. elinguaria* Linn. (1); *T. popularis* Fab. (1); *G. augur* Fab. (1); *A. lithoxylaea* Schiff. (1); *P. chyrsitis* Linn. (1); *A. sexstrigata* Haw. (1); *G. micacea* Esp. (1).

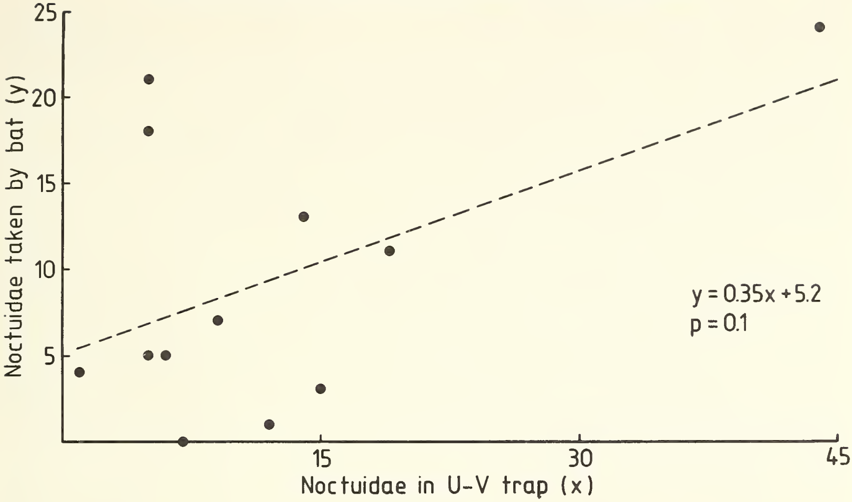

FIGURE 1

Relationship between number of noctuid moths trapped in the U.V. trap and those taken by the bat over the same twelve nights.

significant level is 0.05). These results suggest that only limited data was available, and further work needs to be done to see if there is any significant relationship between the number of noctuides available and those taken by the long-eared bat.

Tables 5 and 6 give nightly catches along with weather data, and show that for July and August, *P. auritus* had the optimum prey-item capture rates under partially cloudy conditions and between 15° and 16°C. Wind speeds at 22.00 hours were remarkably constant throughout those months, and therefore had little effect on bat or moths. It was noted that on full moonlight nights, with low ambient temperatures, or during periods of heavy rain, few moths were caught by the bat.

Discussion

Poulton describes three other British surveys (Whitaker 1902, 1921; Poulton, 1929), and these, along with the 1979 and 1980 Skelton surveys, list between them eighty-four different species of moths on the British list as prey items; only six are common to all four surveys, namely: *E. comes*; *N. pronuba*; *M. brassicae*; Dark Arches *A. monoglypha*; *A. secalis* and *P. gamma*. These six species, listed in Table 1, make up 76.6 per cent of the moth prey items for *P. auritus* and all belong to the family Noctuidae. In the 1980 Skelton survey they accounted for 84.7 per cent of prey items. Otherwise, there is considerable local variation in the less common species taken by the bats.

As in the Skelton survey, other authors have found that the analysis of culled winged remains below a feeding perch can produce new county records. Arnold (1980) carried out a similar study in Huntingdonshire and recorded one new species for that county *(pers. comm.)*.

Neither Whitaker nor Poulton found Thyatiridae in their samples, but Roer (1969) obtained Buff Arches *H. pyritoides*. Some noctuid moths are classified pest species, for example the Turnip Moth *A. segetum* which was reported by Whitaker and Poulton, but not found at Skelton. The Mouse *A. tragopoginis* was a common prey item in both Whitaker's and Poulton's

series, whereas the Skelton series only contained three specimens (1979). Likewise, Whitaker found that *A. monoglypha* made up 26.4 per cent of his total prey items, being much more common than in other surveys, but he did not record Light Arches *A. lithoxylaea*. Both these latter species, according to South (1961), are abundant in some areas.

The Skelton bat took a few Common Wainscot *L. pallens*, which were also trapped in the U.V. trap from mid-July through to August, but neither Whitaker nor Poulton found any. Roer describes The Shoulder-striped Wainscot *L. comma* in his and Hanson's collection from Stockholm (1950). Other Noctuidae variations between the collections are Clouded-bordered Brindle *A. crenata*; Rustic Shoulder-knot *A. sordens*; Dusky Brocade *A. remissa* and Pale Mottled Willow *C. clavipalpis*.

The Herald *S. libatrix*, found at Skelton in 1979 and 1980, was described in Poulton's 1929 series, but not found by Whitaker. He found *S. libatrix*, along with several other sallow feeding noctuid moth remains in a cave at Conisborough (1902). He noted that the *S. libatrix* were still in hibernation, and assumed that the bat had picked the moths off the cave wall (Poulton, 1929).

S. lutea usually an abundant species, is unpalatable to bats. R. Stebbings *(pers. comm.)* states that a captive *P. auritus* will take these moths reluctantly. Whereas Whitaker records neither *S. lutea* nor *S. lubricipeda*, Poulton in his series records both. He states, as was also found in the Skelton study, that 'the high proportion of *S. lutea* in some of his series was probably due to their abundance and the unusual scarcity of other species'.

Like the Skelton findings, few geometer moths were taken by *P. auritus* in other studies, and again, except for *X. fluctuata*, all belonged to the sub-family Ennominae. Whitaker's sample contained more *X. fluctuata* than other series, and in 1902 he found the remains of The Tissue *T. dubitata* in the Conisborough cave.

All studies mention a few other insects taken by *P. auritus*. They include Neuroptera (Green Lacy Wings). Lepidoptera (Small Tortoiseshell *V. urticae*), Diptera (Crane fly) and Coleoptera (including the dung beetle *A. rufipes*).

Identification of the bat using the perch is important, for handling a bat is the only sure way of positive identification, other than the techniques described in this paper. Poulton (1929) in his survey collected together moth wings taken from a number of perches throughout the country including that of Whitaker of Sheffield. He wrote, 'The bat responsible for the collection of wings found in porches, lofts and any quiet, sheltered spot accessible at night through an open window or door, is believed by naturalists to be the common *Plecotus auritus* (Long-eared Bat). This species is known to have dropped the moth wings recorded in Mr Whitaker's long list, and probably dropped those in all the other lists.' Therefore, in this survey, only Whitaker handled his bat.

Roer (1969) published his own results from Eifel in West Germany (Table 2), and compared these with Whitaker for 1921, Hanson of Stockholm for 1950, and Neschwitz for 1956 in Upper Lusatia. Roer's collection of 37 moths consisted of 17 species — 15 Noctuidae, 1 Thyatiridae and 1 Hepialidae. Of these he found that Heart and Dart *A. exclamationis* made up 38 per cent of his sample, with his male *P. auritus* taking only 4 *N. pronuba*. He ringed this male bat in an attic in 1961 and watched it at this roost until 1967, and only once, in 1966, did it use it as a feeding perch. He listed a number of noctuid moths not found in the British series, namely — The Uncertain *C. alsines*; The Brown-line Bright Eye *L. conigera*; The Green Arches *A. prasina*; The Pearly Underwing *P. porphyrea* and the Pale-shoulder Brocade *H. thalassina*.

According to Roer, the Neschwitz Collection contained 273 noctuid moths taken by a male *P. auritus*, comprising 29 different species (Table 2), some of which are not common in this country. The Scarce Brindle *A. lateritia* was the most common in his sample with 66 moths, followed by The Nutmeg *D. trifolii* (27) and The Dotted Rustic *R. simulans* (18). Both *A. pyramidea* (20) and *A. tragopoginis* (17) are to be found in the British series.

Another small, significant study was Whitaker's at Conisborough, near Doncaster. This early record of a feeding perch (31 March 1902), in a cave next to some sallow beds, contained some early emerging noctuid moths as prey items. He found the remains of five sallow feeding noctuid moths, all of which emerge in April and May. These were The Hebrew Character *O. gothica*; The Twin-spotted Quaker *O. munda*; The Clouded Drab *O. incerta* and The Red Chestnut *C. rubricosa*. On the floor of the cave he also found the remains of four noctuid moth species and a

geometer that were still hibernating in the cave, namely *S. libatrix*; The Sword-grass *X. exsoleta*; The Chestnut *C. vaccinii*; The Satellite *E. transversa* and the geometer *T. dubitata*, which is rare in Yorkshire (Poulton, 1929).

Feeding a captive *P. auritus* by various authors has shown a species preference for *N. pronuba* and *M. brassicae* (Lawson-Thompson, 1892). Both Armitage (1905) and Whitaker (1915) fed captive long-eared bats on these species, along with flies, pupae, mealworms, spiders, earwigs and small beetles. Whitaker commented that 'the bat seldom attacked a moth at rest, but if it fluttered or buzzed in the closed hand, then it would attract its attention'. He also noted that it would take the Drinker Moth *P. potatoria* in the captive state (Poulton, 1929). Poulton added grasshoppers to the list of other insects taken in captivity.

Bats hunt and capture their prey using echo-location (Sales & Pye, 1974). Most prey items are eaten in flight, only intermediate to large ones are taken to a feeding perch. Swift (1980) found that 41 per cent of the diet of *P. auritus* consisted of moths, by examining faeces collected from a sheet placed beneath their roost in a roof. She found, besides selecting moths, that they took many other items, such as beetles, large caddis flies, neuroptera, nematocera and a few other diptera, spiders, bugs and earwigs (P. A. Racey *pers comm.*). To take every prey item to a feeding perch would be costly in energy resources for the bat.

On the approach of a bat, many moths, particularly the noctuids, take avoiding action by changing their flight pattern, producing a series of spirals, loopings and altering their speed and direction (Sales & Pye, 1974). The author observed such behaviour at Skelton between *N. pronuba* and the bat (see Results). Some of these moths have primitive tympanic membranes, situated usually on either side of the third thoracid segment. It appears that 'non-reacting' moths are captured at considerably higher rates than 'reacting' moths (Roedar & Treat, 1962). The reacting moths were most sensitive to signals between 40 and 80 kHz (Shaller & Timm 1949), and react more violently to high intensity signals.

Plecotus species are successful in capturing noctuid moths; Roer (1969) found similar prey item remains at both *P. auritus* and the grey long-eared bat *P. austriacus* feeding perches. This may be because the moths they take are predominantly 'non-reactors' or that the bat's echo-location pulses are quiet. They belong to a group of bats known as the 'whispering' bats, which in the British Isles includes the barbastelle *B. barbastellus* Schreber (Yalden & Morris, 1974).

Roer (1969) suggested that *Plecotus* sought out stationary prey by smell, after finding that a captive bat placed in a cage overnight with hibernating *S. libatrix* and *A. urticae* would feed on them. This accounts for Whitaker's Conisborough cave findings and the presence of *A. urticae* in the Skelton bat's diet. The bat will probably use its olfactory senses to avoid distasteful or aposematic species of moth, such as *S. lubricipeda*. Roeder & Fenton (1973), in a Canadian study, showed that hibernating bats and *S. libatrix* could share the same hibernacula, and that though bats would be moving to and fro through the cave entrance in the autumn, the moths situated also around the entrance showed no response to ultrasonic pulses when they were at rest.

The average daily moth prey item totals for July and August at Skelton were 7.5 and 13.7 respectively. Stebbings (1977) states the mean weight for *P. auritus* in January was 8.0 g, for mid-April 7.0 g, and 9.0 g by October, males being 1.0 g lighter at that time. Ross (1967) describes the prey items taken by the American Townsend Big-eared Bat *Plecotus townsendii* Cooper. In this species, similar in size to *P. auritus*, Ross found from dissecting the contents of the stomachs and lower intestines of 38 bats that microlepidoptera were found in 35 of them. Of those 35, only 6 had full stomachs, containing the remains of up to 20 moths of between 3 and 10 mm in body length. Similary with the Allen Big-eared Bat *Plecotus phyllotis*, Ross found moth remains in all the 25 stomachs he dissected, the number of moths per bat being 2 to 15, with body lengths between 6 and 12 mm. He also found the remains of Neuroptera, Coleoptera, Diptera, Hymenoptera and Siphonaptera.

Arctiidae moths are taken only in small numbers by *P. auritus* and as Poulton (1929) suggests they are only taken 'due to their exceptional abundance and an unusual scarcity of other species'. At Skelton this seems to have been the case at the beginning of the feeding season. Although *S. lubricipeda* was present in the U.V. trap (Table 3), none were taken by the Skelton

bat. Only Poulton found this species in his samples. Rothschild (1963) suggested that *S. lutea* was a Batsonian mimic of *S. lubricipeda*, the more distasteful or aposematic species emerging first. *S. lubricipeda* has high concentration of both histamine and acetycholine in its body, which apparently act on the digestive tract of the predator, whereas *S. lutea* has little acetylcholine and no histamine. *A. caja* has both chemicals present. It was also noted that the Skelton bat did not take any of the unpleasant species The Yellow Tail *E. similis*, the barbed yellow-tailed fibres being the unpleasant elements of this moth.

Besides having a pair of tympanic membranes, many Arctiidae can produce sounds, as a series of clicks. These clicks, which are mostly in the ultrasonic range of between 30 and 90 kHz, are produced by a pair of 'tymbal organs' situated below and in front of the tympanic membranes on the third thoracic segment. Although the function of these clicks is not fully understood, a prime consideration is probably to deter bats, and indicate to the predator that they are a distasteful species (Sales & Pye, 1974; Fenton & Roeder, 1974). Some Arctiidae are 'silent', and according to Fullard (1977) in a Canadian study, the silent species emerge mostly in the spring at a time of lower bat activity.

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BOOK REVIEWS

The Pocket Edition of The Oxford Book of Insects by **J. Burton**. Pp. viii + 213, including illustrations. Oxford University Press. 1981. £2.50.

The Pocket Edition is about two and a half times smaller in linear dimensions than the original edition so that it easily fits into a pocket. The text and pictures are similarly reduced. I now find the smaller text difficult to read and some of the pictures, particularly of the damselflies, homoptera, neuropterans, caddis-flies, smaller moths and true flies, are so small that they probably have little value. Nearly 800 species of British insects are illustrated with predominance being given to the butterflies, moths, dragonflies and grasshoppers. However, representatives of all British orders of insects are pictured. English and biological names are used. The text includes descriptions to help identification, general distribution and details of behaviour. The coloured drawings generally illustrate the insects in natural settings and include adult and immature stages. Presumably the main function of this book is to encourage an interest in insects.

MEA

A Complete Guide to British Butterflies by **Margaret Brooks** and **Charles Knight**, with a foreword by David Attenborough. Pp. viii + 159, with full colour illustrations. Jonathan Cape. 1982. £10.95.

This book does an elegant and competent job of covering the British butterflies. It starts with short sections on butterfly biology, breeding, collecting and photography. Fifty-nine species are then given a two-page spread each, followed by short accounts of ten rarities and migrants. The British butterflies are so much a subset of the European fauna, and they have been covered so often before, that one has to ask what another volume on them has to offer. This book scores in the quality of the photographs and the attention given to pre-adult stages. Each species is illustrated as an adult, upper and under side with photographs to indicate sexual dimorphism, and as egg, pupa and early and late larva. The photographs are of high quality. They are nearly always from living insects in natural surroundings, and make for easy identification. More than that, they draw attention to the fact that butterfly watching need not be confined to insects on

the wing, and encourage the reader to follow the natural history of the other stages. For a spot comparison with other works on British butterflies I picked up Robert Gooden's *British Butterflies, a Field Guide*, published in 1978 and the Rev F. O. Morris's *History of British Butterflies* which came out in the mid-nineteenth century. Brooks and Knight score over Gooden in the illustrations of the pre-adults, but otherwise the presentation is very similar. Both have diagrams illustrating the life cycle; possibly those in Gooden, which read from left to right, are easier to follow than the circular charts in Brooks and Knight. Comparison with Morris reveals interesting similarities and differences.

Morris's plates are hand coloured and slightly idiosyncratic but even so include larvae and pupae in many cases. The descriptions of species and the accessory sections on collecting, rearing, etc, have not changed much in form over the years. Morris is happy to pin his captures in boxes as handiworks of the Great Architect of the universe. Brooks and Knight rightly stress the need for conservation, although Morris can regret the loss of habitat brought about by enclosure when writing of the Grayling on the Yorkshire Wolds. He deals with 79 species, however, and even allowing for the fact that some of them are oddities these figures speak for themselves when compared with the 59 which Brooks and Knight can treat in any detail. Their book is a welcome addition to the list, with its visual message on every page that it we are to continue to enjoy them, butterflies must be allowed a place to live.

LMC

Butterflies of Africa by **R. H. Carcasson**. Pp. xix + 100 pages of full colour plates + index. Collins Handguide Series. 1981. £4.95.

This very acceptable little book seems to pack a very wide range of butterflies into its 100-odd pages, shown in clear and sparkling colour paintings by the author. Those illustrated are the ones most likely to be seen, and with its help it should be possible to gain a pretty good idea of the identity of most butterflies from the Sahara to the Cape of Good Hope.

Although only 354 of the 3000 African species are actually illustrated, the range is carefully chosen to cover all the major distinctive groups of species. There is good if brief detail on geographical range, sex differences, mimicry and other points of information. The main text is preceded by notes on classification, distribution and other aspects of biology. The colour key to the biotic provinces on p. xii has gone awry but the mistake is at least obvious.

Caterpillars and pupae are shown in a number of cases. Some of the English names could do with some explanation. What, one wonders, did the Common Joker do to get its name?

This is much shorter and less comprehensive than Collins' *Field Guide to the Butterflies of Africa* published in 1969 but it includes a remarkable amount of information for its size and handsomely succeeds in providing a portable and easy to use guide. Good value at £4.95 for the traveller, armchair or otherwise.

SLS

Nature's Night Life by **Robert Burton**. Pp. 160, with 63 colour photographs, 57 b/w photographs and some line drawings. Bradford Press, Poole, Dorset. 1982. £8.95.

Nature's Night Life includes chapters on birds, bats, African savanna, tropical forests, deserts and seas. The photographs are delightful, the line drawings educative, and the text competent. Antennae, ears, heat sensitive organs, tactile organs and, of course, eyes are discussed and illustrated; echo location systems also receive attention. The physiological constraints on activities of animals by day and by night are compared. The luminescence of krill and other marine organisms is presented as mysterious: 'Krill seem to be doing nothing to avoid predation, apparently surviving by sheer weight of numbers'. Selfish gene theory provides a more valid background for discussion of luminescence than obscure notions of species of populations as the units of selection. This fundamental and explicative theory has as yet barely penetrated the consciousness of biologists and it is perhaps unfair to expect it to have reached popular glossy books. The list of 'Credits' reflects only the indebtedness of the author, and is of little use to the reader; a bibliography would have been more useful.

This book is an ideal gift, especially for any intelligent young person with an interest in the natural world.

DJH

STRATIOTES ALOIDES L. IN THE EAST RIDING OF YORKSHIRE

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Early records suggest that *Stratiotes aloides* L. (Water Soldier) was at least locally frequent along a six-mile stretch of the River Hull valley north of Hull Bridge, near Beverley, in the 17th and 18th centuries and possibly at least until the mid-19th century.

In 1626, Thomas Johnson returned to his native county to visit relatives and records this species as *Militaris aizoides*, the Fresh Water Soldier, saying: 'I found this growing plentifully in the dikes about Rotsey a smal village in Holdernese' (Gerard ed. 2, 1633), GR: 54/06.51. This was the first British record for the species.

In Camden's *Britannia* (ed. Gough, 1789) an anonymous recorder had added *Stratiotes* to the county list of plants, stating that it occurred 'in slow rivers and ponds; at Stork, near Beverley' (presumably Storkhill, GR: 54/04.41). The Rev William Whytehead, whilst vicar of Atwick (1756–1817) compiled a manuscript herball in which he records that Water Soldier grew on Leven Carrs, GR: 54/07.45, and near Hornsea Mere, GR: 54/1.4. The Leven Carr record pre-dates Leven Canal which was cut in 1802. The species is included in the list of plants in Scaum's *Beverlac* (1829) as 'occurring in ditches, near Beverley'. This list was compiled by Col Machell and Dr Hull from their own and Robert Teesdale's observations, but *Stratiotes* is not mentioned by Teesdale (1800). The record in Scaum's *Beverlac* (Poulson, 1829) is repeated by Baines (1840) and Robinson (1902) and Baines' *Flora* also records the species from the River Derwent.

Apart from a deliberate introduction at Hull (Robinson, 1902), there has been no further record for the vice-county until 1979, when it was found in quantity in a borrow-pit by the River Hull, near Beverley, by Misses Higgins and Priest. The question arises as to whether the species had been introduced into the borrow-pit, deliberately or otherwise, or whether it has survived on site. As the species is not known to set viable seed in this country and as research suggests that turions, by which it normally spreads, are not likely to survive for more than three to four years (Dr M. George *in litt.*), long dormancy on site appears initially to be out of the question. The nearest known source of turions which might be spread by birds is a small pond near Thorne (Dr C. Newbold *in litt.*).

However, the following reasons suggest that the possibility of survival on site should be given serious consideration: (i) the fact that the species has re-appeared in that part of the River Hull valley where it was once frequent; (ii) that there was a dike on the first Ordnance Survey map (1858), crossing the site of the pit in which the species now occurs, so that it may have been on site in the mid-19th century; (iii) the water-logged soils of the area provide suitable conditions for long dormancy of seed; and (iv) seeds of *Stratiotes* can remain dormant for long periods, particularly in anaerobic mud (Prof Dr C. D. K. Cook *in litt.*).

Perusal of the literature reveals some interesting facts. Seed-setting by the Water Soldier is governed by temperature. The 'plants are predominantly male south of latitude 52°N, predominantly female above latitude 55°N and functionally male and female in between, where fruits are produced' (Ellis, 1965). This is true for western continental Europe (Nolte, 1825). Although much of England lies between latitude 52°N and 55°N and hermaphrodite flowers have been reported, they appear to be uncommon and ripe seeds have not been noted. However, fossil seeds have been found in pre-glacial deposits in East Anglia.

Production of fruits in the British Isles is rarely mentioned in accounts of the species, but Geldart (1906) gives an illustrated account of fruit found at Sutton, E Norfolk in late September, 1905. Geldart states that ripe seed should not be looked for before the middle of October.

In late October, 1979, I visited the River Hull site with Miss Higgins. Most plants bore turions, and no fruits were found, until it was realised that the peduncles hang down between the leaves. Eventually five fruits were found at different stages of maturity (Fig. 1).

At first, the fruit is flat and green and in the plane of the spathe. It moves gradually making an increasing angle with the spathe, and at the same time it becomes increasingly swollen and

FIGURE 1
Spathes of *Stratiotes aloides* L., bearing fruits at different stages of development, collected near Beverley SE Yorkshire, 24 October 1979. (Photo by R. Wheeler-Osman.)

changes colour. The most mature fruit was very swollen, polished, and orange-brown, lying almost at right angles to the now rotting spathe, which presumably would have soon fallen to the bottom of the pond.

There is little doubt that the change in position of the fruit is correlated with the process of ripening, but the significance of any particular fruit position apparently varies with the locality. Nolte (1825), writing from Copenhagen, observed that in districts where both sexes occur, the fruit forms a right angle with the spathe when quite ripe; also that where only the female plant occurs, the fruit remains erect in the spathe or protrudes only slightly. In contrast in E Norfolk, the fruit began to bend soon after the flower withered in early July and had reached its final horizontal position by mid-September, when the seeds were found to be minute and undeveloped. On the other hand Irmisch, supplied with ripe fruit from Danzig in late October, 1861, found that some fruit were bent perpendicularly downward and that such fruit contained more fully developed seed than others, which were crooked slightly upwards from the horizontal (Geldart, 1906).

The next to ripest fruit collected by me, was cut open and found to be completely filled with a white substance, in which could be seen two well-spaced opaque spots, the size of a pin-head, and each containing a spiral structure. This is in contrast to the observations of Geldart and Nolte which led me to expect chambers each containing seed.

For several years Klinsman in N Germany failed to observe the germination of seed, because the seeds had always been gathered in August and were unripe. In October 1858, he found ripe capsules, took them through the winter in a glass of water mixed with muddy earth, and in the following May obtained the first seedlings. Similarly Irmisch kept ripe seeds constantly in water and most germinated in the following spring and summer, others not until the following year and some in the autumn of the third year (Geldart, 1906).

Knowing this, I kept my ripest fruit in water on the kitchen window-sill. The spathe fell to the bottom of the container, with the fruit projecting above the mud into the water. In the early spring, air-bubbles occurred continuously along the veins of the fruit wall. These observations suggest that the purpose of the change of position of the fruit, in relation to the spathe, is to lift the ripe fruit above the bottom of the pond and facilitate gaseous exchange.

It was suggested to me, that a period of cold may be necessary before germination occurs and I put the container in the garden. This proved to be a mistake, mishaps befell, and I lost my specimen.

My observations, like those of Geldart, suggest the need for further research; it is hard to believe that the changes I observed are meaningless.

In the Netherlands, both sexes of *Stratiotes* occur and viable seed is produced, suggesting that this may be possible in SE Yorks, at least in some seasons. In any case, we can never be certain whether or not in the 18th century, both sexes occurred and viable seed formed.

Whilst introduction, deliberate or otherwise, cannot be ruled out, neither can the possibility of survival on site.

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FIELD NOTE

Some spider (Araneae) records, mostly of upland species

Clubiona norvegica Strand (*64, *65) Sun Bank, Blubberhouses Moor, one adult female found in a *Sphagnum-Juncus* mire on 30/10/80 (SE1453). Crossthwaite Common, Upper Teesdale, one adult female found in *Sphagnum* at the edge of blanket bog on 14/7/80 (NY9223). Previous Yorkshire records are two from the neighbourhood of Rosedale Abbey at Locket and La Touche in 1948.

Diplocephalus protuberans (O.P.-C.) (*62) Kilton Beck, one adult female found under a stone by the stream on 20/5/79 (NZ7017). Six other Yorkshire records.

Erigone arctica (White) (*63) Ogden Reservoir, one adult female found under a stone on bare clay by the water's edge on 8/2/81 (SE0631). Rarely found inland.

Erigone vagans Audouin (63) Ogden Reservoir, one adult female found in the same place as *E. arctica* but on 7/3/81. Apparently this species is becoming more widespread.
Eboria caliginosa Falconer (64, 65) Great Whernside, one male on 21/11/80 (SD9971, alt 540 m). Pen-y-Ghent, one male and six females on 15/6/80 (SD8473, alt 640 m). Starbotton Fell, two males and two females on 12/4/80 (SD9677, alt 570 m). Great Shunner Fell, one male on 24/8/80 (SD8497, alt 660 m). Greensett Moss (Whernside), abundant on 27/5/80 by the tarn (SD7482, alt 590 m). All taken in *Sphagnum*.
Hilaira nubigena Hull (64, *65) Starbotton Fell, one female; Pen-y-Ghent, one female; Great Shunner Fell, three females; all taken with *E. caliginosa*, Mickle Fell, immature male and female (matured later indoors) in a *Sphagnum-Juncus* mire on 15/7/80 (NY8025, alt 660 m).
Hilaira pervicax Hull (64, *65) Timble Ings, one male on 30/10/80 (SE1553). Kex Gill Moor, one female and two males on 30/10/80 (SE1355). Great Whernside, one male and three females on 23/6/80 (SD9975). All found in *Sphagnum*. Great Shunner Fell, males and females found with *E. caliginosa* and *H. nubigena*.
Oreonetides vaginatus (Thorell) (64) Pen-y-Ghent, one male found under a stone in grassland on 15/6/80 (SD8473, alt 670 m). Only two previous, but recent Yorkshire records by Butterfield for Golden Groves (SE09) and Beldon Bottoms (SD99).
Lepthyphantes pinicola Simon (*65) Melbecks Moor, a male and a female found under stones on lead-mine tips on 23/8/80 (SD9301).
Lepthyphantes expunctus (O.P.-C.) (*63) Ogden Plantation, abundant on Scots Pine, 9/8/80 (SE0630). Also taken at Ruin Bank Wood near Harden from Scots Pine on 19/8/80 (SE0937).

I am grateful to Clifford J. Smith who supplied me with the information on past records.
*New vice-county records.

D. Horsfield

STONOR PARK AND BIX BOTTOM NATURE RESERVE

Earlier this year the Berkshire, Buckinghamshire and Oxfordshire Naturalists' Trust opened an exhibition at Stonor Park illustrating the natural history of the Chiltern hills and the Thames valley and the measures being taken by them for the conservation of places of outstanding interest within the three counties. The setting of the exhibition is unusual; it is staged in a roofed courtyard of the Stonor family house, parts of which are 800 years old. One side of the courtyard is the wall of the thirteenth-century Old Hall, with pillars and gothic arches built of blocks of chalk called 'clunch' — a remarkable survival of an ancient way of building with a local material. Another wall is of dressed flint. Ample light comes through the roof windows, and the flint wall supports a luxuriant growth of white toadflax (*Cymbalaria muralis* forma *alba*).

The exhibition shows what can be done by amateurs, using illustrations from magazines, small photographs and drawings pinned to standard display panels. The result is quite unprofessional in its impact, but it gives a simple account of the natural history interest of the beechwoods and chalk grassland of the hills and the wetlands of the valleys. A contoured model shows the locations of the BBONT reserves. The largest of these is only two miles from Stonor at Bix Bottom, and has been named the Warburg Reserve in honour of the distinguished botanist who was the Trust's first Oxfordshire Vice-President. It consists of 247 acres of woodland, scrub and grassland, and harbours such plants as *Paris quadrifolia*, *Aquilegia vulgaris* and *Coeloglossum viride*. Stonor Park is of interest too. It still has its deer, and many fine old trees which support an interesting lichen flora; *Lobaria pulmonaria* was recorded here in the nineteenth century, but has not been seen lately. Interested persons should make a point of asking permission from the owner, Lord Camoys, before entering the park, which is remarkable for its complete lack of internal fencing. Unfortunately damage has been done and serious disturbance caused to the deer by thoughtless persons wandering from the footpath. Permission to visit the Warburg Reserve can be obtained from the Warden at Bix Bottom.

FHB

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1981

Compiled by
A. HENDERSON and M. R. D. SEAWARD

Scaling Dam and Ridge Lane (VC 62), 16 and 17 May (C. Pellant)

Scaling Dam Reservoir is a recent man-made lake beside the A171 Guisborough to Whitby road. Habitats near the shore include marshland, moorland, coniferous plantations and farmland.

On Saturday 16 May fifteen members of the YNU proceeded along Boghouse Lane west of the lake into a small nature reserve, permission to visit it having been kindly given by the Northumbrian Water Authority and the Scaling Dam Nature Reserve Management Committee. After a bright sunny start rain set in by lunch-time, many members returning for an early tea.

The following day, 17 May the luxuriant wooded slopes around Ridge Lane and Staithes Beck were explored in perfect weather. After a short drive from Ridge Lane twelve members assembled for tea at the Grinkle Park Hotel. The President, Mrs Appleyard, presided at the meeting, when reports were given and Mr Flint proposed a vote of thanks to the Divisional Secretary for organizing the meeting.

Mollusca (L. Lloyd-Evans)

Easington Woods proved rich in molluscs and thirty-one species were recorded, fifteen of them additions to the 10-km square in the molluscan atlas. A wealth of dead timber and peeling bark provided shelter for *Limax cinereoniger*, *L. marginatus* and *Cochlodina laminata*, whilst calcareous flushes yielded *Ashfordia granulata* and *Leiostyla anglica*; this last snail, with an Atlantic distribution in Europe, is commonest in Ireland, local in north and west Britain and known elsewhere only in the Channel Islands and the Île de Ré in France.

Flowering Plants and Ferns (C. Pellant)

On the Saturday morning before rain began, the sides of Boghouse Lane, an old, little used track with hedgerows, and the marshland beyond were investigated. Typical species included: *Salix cinerea* (*? subsp. oleifolia*), *Alchemilla glabra, Equisetum sylvaticum, Valeriana dioica, Potentilla palustris, Viola palustris, Hypericum tetrapterum, Caltha palustris* and *Lysimachia nummularia*. Garden refuse dumped by the track produced *Veronica filiformis* and an unidentified (garden) *Saxifraga*.

On Sunday morning in sunny weather the steep slopes of Easington Woods proved more interesting. Plants seen included *Ranunculus auricomus, Lathraea squamaria, Veronica montana*, both species of *Geum* and their hybrid, *Carex pendula, C. sylvatica, Euonymus europaeus, Lysimachia nemorum* and *Orchis mascula*. Of particular interest was *Crataegus laevigata*, in addition to *C. monogyna*, and some members identified a hybrid. After lunch near the ford on the track from Dalehouse towards Boulby Mine *Stellaria neglecta* was plentiful. Along the wooded track *Vicia sylvatica, Carex pendula* and *Equisetum telmateia* grew profusely. Fresh finds included *Hypericum hirsutum* and *H. pulchrum, Primula veris, Scrophularia nodosa, Reseda luteola* and *Barbarea vulgaris*. Over fifty species were recorded in the morning and over seventy in the afternoon.

Bryology (T. L. Blockeel)

Saturday morning was spent in the environs of Scaling Dam. At the edge of the Reservoir, where there was much damp sand, *Dicranella staphylina, Pohlia camptotrachela, Climacium dendroides* and *Drepanocladus aduncus* were found. Nearby in boggy ground was a small flush with *Drepanocladus revolvens, Cratoneuron commutatum* var *falcatum* and *Campylium stellatum*.

On Saturday afternoon's brief visit to Ness Hagg Wood near Liverton, the rocky stream bed of sandstone boulders had some luxuriant bryophyte communities, with *Anomodon viticulosus, Barbula cylindrica, Brachythecium populeum, B. plumosum, Dichodontium pellucidum, Fissidens pusillus, Heterocladium heteropterum* var *flaccidum, Hygrohypnum luridum, Eurhynchium pumilum, Thamnobryum alopecurum, Oxystegus sinuosus, Metzgeria furcata, Plagiochila asplenioides* var. *asplenioides* and *Solenostoma triste*, some occurring in only small

quantity. Elsewhere in the woods were *Thuidium tamariscinum, Eurhynchium striatum, E. praelongum* var *stokesii* and *Plagiochila asplenioides* var *major* as part of the ground flora, and *Calypogeia arguta* on sandy soil under an overhanging boulder.

Similar habitats at Easington Woods on Sunday produced additionally *Trichostomum brachydontium, Heterocladium heteropterum* var *heteropterum* and *Lejeunea cavifolia*. Of special interest in an area not far from Teesside were three epiphytes, *Zygodon conoideus, Ulota crispa* and *Metzgeria fruticulosa*, all very rarely recorded in the vice-county. The track to the old potash mine had *Riccardia pinguis* and *Fossombronia pusilla*, and at the works *Leiocolea turbinata* was on the stonework of an old tunnel.

A card with 120 species was completed for the recording scheme.

Coleoptera (M. Denton)

Heavy rain and wind on the Saturday were not conducive to the recording of beetles, and only four common species were found.

Sunday's weather was more favourable and sixty-six species were recorded, of which the Chrysomelid *Phytodecta pallida* L., of very local distribution in Yorkshire, calls for mention.

Marske in Swaledale (VC 65), 5 June (F. B. Stubbs)

On a day of mixed weather about forty members attended, representing eighteen societies. The morning was spent on the banks of Marske Beck and adjoining open land; later, Deer Park Wood was visited, access having been kindly granted by Mr R. Fitzgerald-Hart and Mr Simpson.

Dr L. Lloyd-Evans took the chair at the meeting for reports. Dr B. Colville spoke of the welcome facilities provided by courtesy of Mrs Simpson and the Management Committee of Marske Village Hall, and thanked the landowners and Divisional Secretary, and Mrs Stubbs for a steady supply of tea.

Lepidoptera (Joyce Payne)

In discouraging weather little was flying. Larvae of Feathered Thorn and Pale Brindled Beauty were found, and much foliage had been attacked by Mottled Umber and other defoliating geometridae. The July Highflier was bred from female catkins of sallow. The ubiquitous Silver-ground Carpet and Common Carpet, and the Clouded Border, quite uncommon in VC 65 were seen. Eggs of the Orange-tip and Small Tortoiseshell, and a male Brimstone butterfly sighted in brief sunshine complete the list of macros. *Yponomeuta* nets were noted on *Prunus padus*.

Other Arthropods (D. T. Richardson)

Habitats ranging from calcareous to non-calcareous, were included in four previously unrecorded 10-km squares. Collecting was helped by the ground's high moisture content from earlier heavy rains which kept the animals at the surface.

Six woodlice, seven centipedes, eleven millipedes and four species of harvestmen were taken. Of the woodlice, *Androniscus dentiger* (in roadside sythanthropic rubbish), *Haplophthalmus mengei* (under stones amid rich humus in limestone woodland) and *Porcellio spinicornis* (under topstones of a limestone wall) are worthy of note. The centipedes consisted of the common large and several smaller lithobids, a geophilid and *Strigamia acuminata*, one of our less common woodland species. Noticeable among the millipedes were large numbers of the spotted snake millipede, *Blaniulus guttulatus*, and the small flat-back, *Brachydesmus superus*, under stones in rich humus in limestone woodland, the specimen of *Polydesmus denticulatus* under a stone in a grassy glade in Deer Park Wood and the orange-striped *Ommatoiulus sabulosus* in long grass. Although harvestmen do not come into their own until about mid-July *Mitostoma chrysomelas* and *Megabunus diadema* were found on limestone walls and ledges.

Flowering Plants and Ferns (J. E. Duncan)

From the morning walk by Marske Beck, and roadside observation over 160 species were listed for grid square NZ 10. Unrecorded for this square in the Atlas were: *Thlaspi alpestri, Epilobium nerterioides, Valerianella locusta, Sonchus oleraceus, Sonchus asper, Carex pilulifera* and *Festuca rubra*. Other species of interest included *Cardamine amara, Stellaria nemorum, Sherardia*

arvensis, Doronicum pardalianches, and typical wall-ferns, *Asplenium ruta-muraria, A. trichomanes* and *Cystopteris fragilis*. A fine stand of *Geum x intermedium* was seen by the roadside. On the grassy bank beside the beck an attractive patch of pansies keyed out to *Viola tricolor*, yet had flowers exactly the colour of *Viola lutea* as found in Craven, though smaller. Both species are recorded for NZ 10, and the plant here would merit more critical examination.

Deer Park Wood was visited in the afternoon. Since the last felling the re-planted mixed conifers and hardwoods had not grown up to more than five or six feet, and the ground flora was rich and varied with, e.g. *Silene dioica, Primula veris* and *Ajuga reptans* flowering profusely. The last is new to the Atlas for grid square NZ 00 as are *Lysimachia nemorum, Endymion non-scriptus* and (probably brought in during tree planting) *Lycopodium selago*. Also in the wood was *Sambucus racemosus*, most likely bird-sown from shrubs known by a local naturalist to have been planted by Marske Beck in 1950.

Bryophytes (T. L. Blockeel)

The localities visited were not of a kind where a particularly rich bryophyte flora could be expected. Most of the recording was done in 10-km squares 45/00 and 45/10, with forty and sixty-five species respectively.

Marske Hall: a very small amount of *Orthotrichum pulchellum* was the second recent VC record for an epiphyte formerly more common in the county.

Marske Beck: rocks by the stream had *Cinclidotus fontinaloides, Orthotrichum* var *riparium* and *Rhynchostegiella teesdalei*. A nice find on chestnut (*Aesculus*) was the epiphyte *Orthotrichum stramineum*, also a second recent record for the vice-county.

Applegarth: a wooded slope with limestone scree and outcrops had *Zygodon viridissimus* var. *stirtonii* and *Plagiochila britannica*.

Deer Park Wood: the mature woodland was poor in species. *Plagiothecium curvifolium* was on pine litter, and *Gymnostomum aeruginosum* on a seepage zone on limestone rock. The moist track at the entrance to the woods produced *Riccardia sinuata, Pleuridium subulatum* and other colonists of bare gound. *Ditrichum flexicaule* was on the wall below the wood.

Lichens (A. Henderson)

Of seventy-nine lichens recorded during the day the following were of most interest: *Agonimia tristicula*, muscicolous, occasional on old stone walls; *Buellia punctata*, corticolous, noticeably out-competed in the area; *Hypocenomyce scalaris*, and *Lecanora expallens*, both found fruiting; *Micarea botryoides*, near the base of tree-boles, with subcoralloid pycnidia; *Opegrapha herbarum*, corticolous; *O. niveoatra/rufescens*, on a shaded dying tree (the two species indifferentiable in their pycnidiate forms, although the thalline hue of this plant is suggestive of *O. rufescens*); *Thelidium mesotropum*, on small stones in the path of Deer Park Wood, an overlooked plant with tiny perithecia; and *Verrucaria hydrela*, aquatic, on submerged stones in stream, Deer Park Wood.

The status of Marske lichens as an indicator of air quality will be the subject of a paper to appear in the *Naturalist* shortly.

Ramsden Clough (VC 63), 13 June (W. Ely)

Ramsden Clough curls south from Holmsbridge into the moors. The northern part has been dammed to form reservoirs banked with conifer plantations, while higher up the clough an old hawthorn wood gives way to grassland with wet flushes. On the eastern edge of the Clough traces of quarrying can be seen.

Although the weather was threatening, the rain held off. We walked through Green House Hey Wood, then explored the upper parts of the Clough. Tea and the meeting were at the Bridge Tavern, Holmsbridge, with Mr Flint in the chair. Our thanks are due to the Forestry Commission and the Yorkshire Water Authority and their tenants for permission to visit.

Vascular Plants (D. R. Grant)

The area lies on the Millstone Grit Series of the Central Pennines. The higher ground, around 500 metres, consists of acid peaty moorland with *Eriophorum* sp. *Nardus stricta*, L., *Molinia*

caerulea (L.) Moench., *Empetrum nigrum* L. and smaller amounts of *Calluna vulgaris* (L.) Hull, *Vaccinium myrtillus* L. Cliffs of sandstone with thin shale strata dominate the upper end of the main clough.

Large clumps of *Dryopteris borreri* Newm. and *Thelypteris oreopteris* (Ehrh.) Slosson. were main features of the Grit Series, while the bogs had abundant *Carex laevigata* Sm. In the small area of old natural woodland in the centre of the clough the dam wall of Riding Wood reservoir had *Asplenium ruta-muraria* L., the drier parts of the valley *Polygala serpyllifolia* Hose and *Melampyrum pratense* L. and the woodland Alder, some fine Aspens and *Equisetum sylvaticum* L. Marshy ground nearby had *Crepis paludosa* (L.) Moench., *Equisetum fluviatile* L., and characteristic sedges.

A feeder stream inlet at Yateholme Reservoir had *Potamogeton polygonifolius* Pourr. and *Ranunculus lenormandi* F. W. Schultz. In a small Sphagnum bog in Netherly Clough was a colony of *Narthecium ossifragum* (L.) Huds. As leaves of the common Spotted Orchid in two marshy areas suggested both species may be present, these areas will be checked at flowering time.

Bryology (T. L. Blockeel)

Most of the Clough was rather poor, in spite of the large rock exposures at the valley head. *Nardia compressa* and *Solenostoma sphaerocarpum* were recorded by the stream, *Fissidens adianthoides* and *Solenostoma triste* on wet shale, and *Solenostoma pumilum, Brachydontium trichodes, Seligeria recurvata, Blindia acuta* and *Tetrodontium brownianum* on moist or wet grit. The scree below the old quarry had *Rhacomitrium lanuginosum, R. heterostichum, Bryum pallescens, Encalypta streptocarpa, Barbula recurvirostra* and *Tortula subulata*, the last three not normally associated with this habitat. The more luxuriant wooded lower part of Rake Dyke included *Atrichum crispum* by the stream, and *Cratoneuron commutatum, Blindia acuta, Tetrodontium brownianum* and *Hookeria lucens* on dripping cliffs.

Entomology (W. A. Ely)

The Forestry Commission's conifer plantations at Green House Hey Wood produced several typical ladybirds — *Myrrha 18-guttata* (L.), *Aphidecta obliterata* (L.), *Neomysia oblongoguttata* (L.) and *Anatis ocellata* (L.) (or the Eyed Ladybird, also present as a variety lacking the yellow rings around each spot). The Upland Click-Beetle (*Ctenicera cuprea* (Fab.)) (in both its purple and straw-banded colour forms) and the weevil *Phyllobius calcaratus* (Fab.), normally rather uncommon, were abundant. Two uncommon hoverflies here were *Sphaerophoria rueppellii* (Wied.) and *S. abbreviata* (Zett.).

The old hawthorns bordering the stream higher up proved richest for insects, the prize being the rare wood-boring beetle *Hyloceotus dermestoides* (L.) flying in some numbers near the stream. Other wood-feeders were the weevil *Hylobius abietis* (L.), found by Mrs Flint, the longicorns *Rhagium mordax* (DeG.), found by Mr Denton, and *R. bifasciatum* (Fab.) (including a colour variety with the normally discrete bands being widened and diffuse). Mr Marsh found the soldier beetle *Rhagonycha testacea* (L.) and the leaf-beetle *Calomicrus circumfusus* (Marsh.), Mr Denton the weevils *Barypeithes sulcifrons* (Boh.) and *Leiosoma deflexum* (Pz.), and both found the click beetle *Selatosomus incanus* (Gyll.). The large craneflies *Tipula maxima* (Poda) and *Pedicia rivosa* (L.) were seen and among many hoverflies were *Cheilosia fraterna* (Mg.) and *Sericomyia silentis* (Harris), while Mr Blunt found *S. lappona* (L.) higher up the Clough.

Above the hawthorn wood were the ground beetles *Carabus violaceus* (L.) and *C. problematicus* (Herbst.), Dr Lloyd-Evans found the large snail-eating *Cychrus caraboides*, and Mr Marsh *Notiophilus aquaticus* (L.) and *N. germinyi* Fauvel. Here Mr Denton found the pill beetle *Cytilus sericeus* (Forst.) and the leiodid *Agathidium arcticum* Thoms.

Lepidoptera (Joyce Payne)

The glades of the streamside produced good numbers of day-flying moths with finely marked examples of the Small Argent and Sable the Common White Wave and the Brown Silver Line. Among conifers were the Grey Pine Carpet, Bordered White and Tawny-barred Angle

abberation *nigrofulvata*. The Common and Silver-ground Carpets, the Clouded-bordered Brindle, Large Yellow Underwing, Common Heath and a fine specimen of Light Knot-grass were seen. Godfrey Blunt named *Syndemis musculana* Hb. and *Olethreutes lacunana* (D & S), members of the Tortricidae. No Emperor or Eggar evidence was found on higher moorland nor were eggs and larvae of Small Tortoiseshell and Orange Tip, only the Green-veined White butterfly being common.

I am obliged to several local members, in particular to ten-year-old Joanna Vasey.

Other Arthropods (D. T. Richardson)

Most 'other arthropod' species prefer more calcareous substrata, but with no previous records for 10-km square SE(44)10 the effort of exploration was worthwhile.

Woodlice (3 species): even the ubiquitous *Oniscus asellus* and *Trichoniscus pusillus* had to be searched for. *Androniscus dentiger* predictably turned up amongst stonework and mortar rubble of a ruined building.

Millipedes (3 species): *Cylindroiulus punctatus* and *Proteroiulus fuscus* under bark of a rotting tree stump and the little known *Polydesmus coriaceus* (= *P. inconstans*) under stones on the moor.

Harvestmen (2 species): the late spring — early summer *Mitopus morio* and *Megabunus diadema* under stones on an old quarry tip. Centipedes (6 species): these animals tolerate quite acid environments. *Lithobius variegatus, L. forficatus, L. crassipes* and *Geophilus carpophagus* (under stones on the moor) in numbers. *Brachygeophilus truncorum* under the bark of a rotting log. *Lithobius calcaratus*, spotted by Dr L. Lloyd-Evans running in a fire-break in a coniferous plantation, is not particularly common in Yorkshire but has an uncanny habit of turning up in the most unexpected places.

Ornithology (J. E. Dale)

Forty-five species were recorded, including in the coniferous plantations Jay, Coal Tit, Goldcrest and Redpoll and, less expected, a party of four Crossbills. Probably most numerous in woodland was Chaffinch with Willow Warbler less common. At least five male Tree Pipits were in song in Green House Hey Wood with a male Redstart in territory. A Redstart pair was nesting in an occupied building near Riding Wood Reservoir dam, a pair of Common Sandpipers were on the reservoir banks, and a pair of Pied Wagtails were nesting in a wall near the dam.

Up the valley a Dipper's nest in the stone wall bank of the stream contained three young. A Ring Ouzel was singing near the valley head, and moorland species including Red Grouse, Golden Plover, Snipe and Curlew were around Ramsden Clough. Of interest here was a pair of Wrens breeding 370 metres above sea level.

A brief sighting was obtained of a Sparrowhawk; at least one Kestrel pair and both male and female Cuckoo were present. Siskins, spreading steadily in South and West Yorkshire were unseen.

Rathmell (VC 64) 28 June (J. Payne)

Rathmell is on the south bank of the River Ribble, some two miles from Settle. Stock rearing and milk production are the main occupations, though a small acreage is under the plough. There has been little use of pesticides, agriculture and natural history having gone hand in hand. We visited the banks of the Ribble between the old sewage works and the village of Rathmell, Lumb Gill, Hesley Moss, Dubbs Beck and Upper and Lower Greenwoods. It was warm and sunny in the morning, but dull later.

Forty members attended the excursion and meeting for reports in Rathmell Reading Room, when Dr L. Lloyd-Evans took the chair and Mr and Mrs Weston, who had given permission for visiting much of the area, attended. Hesley Moss is an outstanding area and members were delighted to hear it is registered as Common Land.

Entomology (J. and K. C. Payne)

On the whole insects were few and unremarkable. Only two butterflies were seen, the Green-veined White flying over Hesley Moss and Small Tortoiseshell larvae near the Ribble.

The Chimney Sweeper, Silver-ground Carpet, a Minor and the Clouded-bordered Brindle were noted and fully fed larvae of the Clouded Drab and the Common Quaker. Tree foliage showed little evidence of any attack by the early emerging noctuids or geometrids, but a few webs of *Yponomeuta* species were seen on Bird Cherry. A good colony of the Smoky Wave *Scopula ternata* Schrank. was seen on Hesley Moss. One person spent the whole day dipping in the peat pools there and was surprised to find vast quantities of the rarely reported Water Spider emerging because of the drought.

Other Arthropods (D. T. Richardson)

The enthusiasm of members during the session added the following species to the already well-documented lists in the Union's records for 10-km squares SD(34) 75, 76, 85 and 86. Woodlice — *Androniscus dentiger*. Centipedes — *Geophilus insculptus, G. electricus, Lithobius calcaratus* and *L. macilentus*. The most interesting find of the day by Mr A. Sutherland under a stone amongst long grass on the railway embankment at Gildersleets SD(34)806624, a single ♀ *Geophilus electricus*, may constitute a new Vice-county record. Thanks are due to Mr A. Sutherland, Dr and Mrs L. Lloyd-Evans.

Ornithology (M. Denton)

The area around Settle Sewage Farm has attracted many interesting bird species, but in June, one of the quietest ornithological months, only common breeding species were seen. In the meadows downstream from Settle, Sand Martins were breeding in the river banks and Yellow Wagtails were particularly numerous. There were the usual breeding waders, Redshank, Lapwing, Curlew, Oystercatcher, Snipe and Common Sandpiper. Many of the birds were flocking, with up to 200 Lapwing and a party of nine Common Sandpiper. In the wooded valleys around Rathmell, species were few, but there were three sightings of Green Woodpecker and warblers included Blackcap, Garden Warbler, Whitethroat, Willow Warbler and Chiffchaff. Altogether fifty-two species were recorded.

Flowering Plants and Ferns (D. R. Grant)

The morning was spent examining the River Ribble between Settle and Rathmell. The water had large colonies of *Ranunculus aquatilis* subsp. *pseudofluitans*, the gravelly banks extensive *Rorippa sylvestris* with occasional *Cochlearia officinalis* and *Schrophularia umbrosa*. In an old field hedgerow were three fine *Malus sylvestris*. Beside a feeder stream grew *Mimulus guttatus, Glyceria plicata* and *Nasturtium microphyllum*, and the roadside hedge had a colony of *Prunus domestica* with a few *Geranium pratense* and *Galium mollugo* in the verge.

After lunch Lumb Ghyll streamside yielded *Primula vulgaris, Crepis paludosa*, and higher up, a single *Populus canescens*. Around Rathmell village, walls were covered with *Sedum acre, Saxifraga tridactylites* and *Geranium lucidum*, and *Asplenium adiantum-nigrum* and *Polygonum cuspidatum* were found. *Rosa villosa, Stachys officinalis* and *Dryopteris borreri* occurred along lane sides. The fields on the way up to High Hesley had *Juncus acutiflorus*, *Pedicularis palustris* and some sedges.

Hesley Moss was reminiscent of the much larger Austwick Moss. Both species of *Eriophorum* were here in quantity. On old peat diggings covered with *Sphagnum* grew much *Oxycoccus palustris*, a few colonies of *Drosera rotundifolia* and two unusual sedges, *Carex curta* and *C. rostrata*. There was also a colony of *Myrica gale*, some Heath Spotted Orchids (*Dactylorchis ericetorum*), and very large colonies of *Narthecium ossifragum*.

The best find of the day was two colonies of *Pyrola minor*, in the edge of Huggan House Wood.

Around Dubs Beck, visited in the evening, several flushes had abundant *Anagallis tenella*, and *Potamogeton polygonifolius* and *Veronica scutellata* occurred in two streamlets. *Drosera rotundifolia* and *Hydrocotyle vulgaris* grew amongst Sphagnum. There were a number of sedges typical of acid moorland and, in stony, muddy flushes, *Carex demissa*, *Triglochin palustris*, and *Isolepis pauciflora*.

Bryophytes (E. Ormand)

The area was not very rich, species seen included: on walls and boulders, *Orthotrichum diaphanum, Neckera complanata, Rhacomitrium heterostichum, Orthotrichum anomalum, Tortula subulata* and the hepatic *Frullania tamarisci*; in the becks, *Eurhynchium riparoides, Fontinalis antipyretica, Hygrohypnum luridum,* and *Dichodontium pellucidum*, and the hepatic *Aplozia riparia*; in the woodland, *Isopterygium elegans, Isothecium myosuroides, Plagiothecium denticulatum P. undulatum* and the hepatic *Plagiochila asplenoides*; amongst the acid, heathy grassland, the hepatics: *Diplophyllum albicans, Calypogeia fissa, Lepidozia reptans, Lophozia ventricosa, Barbilophozia attenuata* and *Cephalozia bicuspidata. Dicranoweissia cirrata* on a few trees; on the dried peat around Hesley Moss *Sphagnum capillifolium.*

Holme upon Spalding Moor (VC 61), 4–5 July (B. S. Pashby)

The area explored was at one time at the northern end of the huge morass of Wellingfen. Snake Hall Plantation and the Duck Nest Farm area of Hotham Carrs, both to the east of the Market Weighton Canal, were visited on Saturday. Sunday was first spent at Hasholme Carr Farm where Mr Geoff Morton farms traditionally with minimal chemicals. Parties then visited other parts of the Carrs, including Land of Nod on the west side of the Canal, the area between Hasholme Grange and the River Foulness, Arglam Wood and Tollingham Warren. About fifty members attended in dry, sunny weather. Tea at the New Inn, Holme, was followed by a meeting for reports, chaired by Miss Eva Crackles, with twenty-six members present and seventeen Societies represented. It was agreed that the attention of the Nature Conservancy Council be drawn to the Duck Nest area. Thanks were voiced from the Chair to the various landowners and farmers for permissions given and Mr Colin Shields thanked the Divisional Secretary for organizing the meeting.

Entomology (W. A. Ely)

Snake Hall Plantation held large numbers of common woodland insects, including the Fern Bug (*Bryocoris pteridis*) and the pipunculid *Verrallia aucta*. The dry heathland north of the Plantation had the flower bug *Acompocoris pygmaeus* on Scots Pine and the capsid *Asciodema obsoletum* on Gorse. Most of the Black Ants running around were *Formica lemani* but there was also its Southern counterpart *Formica fusca*. This ant is unknown north of the Humber according to the Provisional Atlas. Among the insects at Duck Nest was the uncommon hoverfly *Pyrophaena rosarum*, while the disused canal at The Land of Nod had the soldierfly *Beris geniculata*. A visit to Hasholme Farm produced the odd-looking fly *Micropeza corrigiolata* and the uncommon hoverfly *Platycheirus fulviventris*.

Coleoptera (M. Denton)

On Saturday morning the area around Snake Hill Plantation produced little variety. However, Mrs Payne and Mr Shields found the extremely rare Longhorn *Leptura quadrifasciata* L. Another very rare species *Agathidium nigrinum* Stn. was found behind the bark of a fir tree. A gamekeeper's gibbet produced only two common species, namely the Clavicorns *Dermestes murinus* L. and *Omosita discoidea* F.

In the afternoon the number of beetle species was tremendously increased in the wetland area around Duck Nest. The dykes were particularly good for water beetles, several species of *Helophorous, Hydroporus, Illybius* and *Agabus* being taken.

On Sunday morning, as the Market Weighton Canal at Land of Nod was dry, the rotting vegetation along its bank was sieved, producing many of the smaller Roves (most notably *Stenus bimaculatus* Gyll., *Xylodromus concinnus* Marsh. and *Platystethus cornutus* Grav.) and the ground beetle *Stenolophus mixtus* Hbst., and Mr Ely found the Longhorn *Clytus arietis* L. After lunch the wood near Mr Morton's farm at Hasholme Carr produced little but several small weevils. Two of these were the beautifully marked *Coeliodes dryados* Gmel. and *Nanophyes marmoratus* Goez. Mr Payne, working the marl ponds for water beetles found very few. In this area Mr Ely found two rather local beetles, *Sphaeroderma testaceum* L. and *Crytocephalus pusillus* F. A Total of 118 species was recorded for the weekend.

Lepidoptera (Joyce Payne)

In such a poor butterfly year it was pleasing to record thirteen species on the two days. Female Orange Tips in fine condition in the deep dyke beyond Snake Hall Plantation were presumably still waiting to oviposit. Ringlets were seen in all three localities visited on Sunday. It was especially gratifying to net a Brimstone at Hasholme Carr Plantation but as neither of the buckthorns on which the larvae feed was known from the district, it was presumbaly passing by. Eleven larger moths were recorded, the most interesting a very fine aberation of the Yellow Shell from Land of Nod. The Blood Vein was seen near Hasholme Grange and larvae were swept off sorrel at Snake Hall Plantation. The micro the Green Oak Tortrix was in Hasholme Carr Plantation in good numbers.

Other Arthropods (D. T. Richardson)

Collecting was confined to a coniferous plantation on sandy soil near Snake Hall SE(44) 865347 and a farm yard at Hasholme Carr SE(44) 831337. A marl pit in the farm land contained the isopod *Asellus aquaticus* and large numbers of *Metopornorthus pruinosus* were found under stones and rotting straw in and around the farm yard. The woodland produced five woodlice — *Oniscus asellus, Porcellio scaber, Philoscia muscorum, Trichoniscus pusillus* agg. and *Armadillidium vulgare*; four millipedes — *Ommatoiulus sabulosus, Cylindroiulus punctatus, Proteroiulus fuscus* and *Polydesmus angustus*; two centipedes — *Lithobius forficatus* and *Geophilus carpophagus*; and three harvestmen — *Mitopus morio, Nemastoma bimaculatum* and *Oligolophus tridens*. My most grateful thanks to Dr Lloyd-Evans for all these collections from an unrecorded 10-km square.

Ornithology (B. S. Pashby)

Species recorded on Saturday in Snake Hall Plantation included: Sparrow Hawk, Kestrel, Woodcock, Green and Great Spotted Woodpeckers, Willow Tit, Blackcap, Garden, Sedge and Willow Warblers, Goldcrest, Spotted Flycatcher, Goldfinch and Redpoll. In the Duck Nest area of Hotham Carrs, additions were: Heron, Red-legged Partridge, Oystercatcher (known to breed in the vicinity), Snipe and Lapwing. The Black-headed Gull colony here held many young birds still attended by adults and a few Lesser Black-backed Gulls nearby could have been 'hangers on'. Stock Dove, Long-tailed Tit and Mistle Thrush were seen in a small birch copse and in the more open parts Whinchat and Yellow Wagtail. On the Sunday, several areas of old Spalding Moor were visited, in particular Mr Geoff Morton's farm at Hasholme Carr, where Turtle Dove, Tree Creeper and Jay were recorded in the plantation; Barn Owl was known to be breeding in one of the farm buildings and at one of the old marl pits, a male Reed Warbler was displaying in a small bed of *Phragmites*. Sixty-six species were recorded for the two days.

Mammals and other Vertebrates (B. S. Pashby)

Species noted were: Hedgehog, Mole, Common Shrew, Hare, Rabbit and Water Vole. A keeper's gibbet was found displaying the remains of: Grey Squirrel, Brown Rat, Fox, Stoat and Weasel. Amphibians noted were Frog and Smooth Newt. Sole evidence of the reptilia was the sloughed skin of a Grass Snake.

Flowering Plants and Ferns (Eric Chicken)

Many members went to Snake Hall Plantation first. Though not too exciting, it contained *Populus tremula* and *Ilex*, the latter not given in the *Atlas* for the 10-km square, a probable indication of under-recording of trees in the vice-county. On more open ground to the north was *Veronica officinalis* and two forms of *Salix repens*. In the area south of Duck Nest, a ditch had small amounts of *Baldellia ranunculoides, Thalictrum flavum* and *Isolepis setacea* (*Scirpus setaceus*), relatively bare sandy ground and track edges afforded *Aphanes microcarpa, Filago minima* and *Spergularia rubra*, and growing turf was *Potentilla anglica*. In a wetter area under coarser vegetation was a mass of *Hydrocotyle vulgaris* and *Viola palustris* with a surprising amount of *Scutellaria galericulata* nearby. One small wood near Duck Nest and others in the 10-km square contained *Corydalis claviculata* and field margins had *Lycopsis* and *Amsinckia* sp.

At Hasholme Carr Farm not as rich in arable weeds as expected, *Galeopsis tetrahit* and *G. speciosa* were noticed. In marl pits and ditches *Lythrum salicaria, Stachys palustris* and

Potamogeton natans were found. The River Foulness had *P. pectinatus, Nuphar lutea* and *Rorippa islandica* and *Centaurea cyanus* and *Apera spica-venti* were in a bean field at Bursea.

Going in Arglam Wood was difficult because of brambles. *Digitalis purpurea* and *Polygonum hydropiper* grew here in a clearing. Tollingham Warren, though largely covered with plantation, had a sandy extent with little plant cover and a marshy stretch with a magnificent display of hundreds of *Dactylorchis fuchsii*. Also here were *Erica tetralix, Galium uliginosum Lychnis flos-cuculi* and *Veronica scutellata*.

The total number of species reported and claimed for the two days was 222 and four hybrids.

Plant Galls (F. B. Stubbs)

Several interesting examples were among the twenty-eight galls seen during the weekend. Swellings at the base of the leaves of *Quercus* indicated the gall-wasp *Andricus testaceipes*; this gall may be inconspicuous rather than rare. Red leaf galls on *Rumex acetosella* produced larvae of the beetle *Apion frumentarium*. The stem gall on *Galium verum*, attributed to the gall-midge *Geocrypta galii*, was found near Hasholme. Rare or unkown in many parts of Britain, it is often seen in more westerly areas of Yorkshire. Growths on the stems of *Salix repens* occurred at Snake Hall Plantation; these are attributed to a gall-midge, *Rhabdophaga* sp.

Bryophytes (J. Robertson)

The arable land around Holme was dry but eighty species were recorded: *Pottia starkeana* ssp. *conica* (a new record for VC 61), *Aloina aloides* var. *aloides, Bryum violaceum* and the hepatics *Riccia glauca* and *R. sorocarpa* on soil in fallow corners of fields.

Mud in an old gravel pit was colonized by *Barbula unguiculata, Dicranella varia, Leptobryum pyriforme, Bryum klinggraeffii*, etc, with *Leptodictyum riparium* and *Riccardia pinguis* in damper parts. *Aloina rigida* occurred on bare soil on a chalky slope nearby.

On bare heath patches nearby Snake Hall were *Bryum bicolor, Campylopus pyriformis, C. introflexus, Polytrichum juniperinum* and *P. piliferum*. Around the pools *Aulacomnium palustre, Calliergon cordifolium, C. stramineum, Drepanocladus exannulatus, Leucobryum glaucum, Polytrichum commune, Sphagnum capillifolium, S. fimbriatum, S. palustre, S. recurvum* var. *mucronatum, S. squarrosum, S. subnitens* and the hepatics *Calypogeia fissa* and *Marchantia polymorpha* flourished.

Additional species at Tollingham Warren were *Brachythecium velutinum* and *Dicranoweissia cirrata* on tree trunks, and *Tortula intermedia*, covering an old roof nearby.

FIELD NOTES

A new pseudoscorpion for the north of England

Because of taxonomic difficulties and the lack of a reliable key to species, pseudoscorpions have been somewhat neglected by collectors in the past. So far, only twenty-five species have been found in the British Isles, and their distribution has recently been described by Jones (1980).

Compared to other northern counties, Yorkshire pseudoscorpions have been reasonably well recorded, although many Yorkshire records date from pre-1960 collections. There are approximately 197 10-km national grid squares in Yorkshire and of these some forty have had at least one record post-1960 while a further thirty-six have had only pre-1960 records (data from Jones (1980)).

There are twelve previously recorded Yorkshire pseudoscorpions, which are reviewed by Howes (1971). Unfortunately four of these species are only represented by pre-1960 records. The purpose of the present note is to record a new species for Yorkshire, *Roncus lubricus* (L. Koch). One female individual was taken at Hetchell Wood N.R. near East Rigton, Leeds (VC 64; 44(SE)3742, alt 75 m), during November 1978. The specimen was taken under a lump of magnesian limestone at the base of the old quarry face; such damp places are quite characteristic of the habitat of this species. Although this species is well recorded from southern and western counties in England and from along the Welsh coastline, there have been no previous records in England north of Bedfordshire. This new record tends to suggest that this species has a more widespread distribution than was thought previously.

Pseudoscorpions are engaging creatures and much remains to be known about their distribution and ecology. There is no doubt that 'every record is valuable' (Howes, 1971) and naturalists finding pseudoscorpions while collecting other invertebrates are urged to keep their specimens for subsequent identification.

I should like to thank Dr P. D. Gabbutt of the Zoology Dept, University of Manchester for the determination of the specimen, and Mr Colin Howes for confirmation of its status in Yorkshire.

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A note on the recovery of buried acorns by the Grey Squirrel

The grey squirrel (*Sciurus carolinensis* Gmelin) is well known for its habit of hoarding food during the autumn for use in winter. Eibl-Eibesfeldt (1967) found this to be a stereotyped behaviour which is triggered by the superabundance of food. The hoards are located by scent (Shorten, 1954), though Tittensor (1977) considered that memory may also be used to locate the general area of storage.

On 22 January 1979 two squirrel trails were noted in a mixed oak and birch wood in the Limb Valley, Sheffield. Each was found to connect a series of sites of diggings through 15 to 30 cm of snow and a small way into the soil beneath. These diggings were for acorns which, if successfully located, were identifiable by the presence of acorn husks littering the floor of the hole. Data from the diggings are as follows:

	Trail One (around 43/306830)	Trail Two (around 43/305828)
No of sites of diggings	5	5
Total no of holes	29	24
Range of holes per site	3–9	3–7
No of holes containing stored acorns	21	12
Success in locating hoards through snow (15–30 cm)	72%	50%

These data indicate:

1 Hoards are not made at random throughout the forest floor, but rather are situated in groups. The diggings were in distinct sites, the holes in each site being about a metre apart and the sites twenty to thirty metres apart. Presumably this aids the task of locating the general areas of storage.

2 The squirrel was not always successful in locating a hoard (success rates of 72 and 50 per cent being recorded). It may be that this was because the scent of the acorns was much reduced due to the snow cover, making it difficult for the squirrel to locate them.

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Ian Alcock

TUBER AESTIVUM Vitt. — SOME ECOLOGICAL OBSERVATIONS ON THE INTER-RELATIONSHIP BETWEEN TRUFFLES, SQUIRRELS AND HOLLY

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Following the discovery of *Tuber aestivum* at Headingley, Leeds (Preece & Redshaw, 1978), regular observations have been kept on the site. However, due to the fact that quite a considerable proportion of the soil heap had been removed during the original excavations when the first specimens were found, only limited searches have been undertaken. Nevertheless on each of two occasions between 1977 and 1981 the remains of a single specimen have been found. These remains constituted part of the easily identifiable 'warty' skin surrounding a black powdery spore mass.

A major discovery was made on 11 October 1981 following the observation of a common grey squirrel *(Sciurus carolinensis)* foraging at the site. Upon its departure investigation revealed a small hole, approximately 6–7 cm diameter and 5 cm deep, at the bottom of which was the unmistakable veined interior of a *T. aestivum* fruit-body. This specimen, 81.01, was consequently dug up and, apart from the squirrel damage, found to be in fresh condition with a weight of 52g. Further observations revealed two other freshly dug holes each of similar size and showing in the bottom of the hole the interior of a *T. aestivum*. These two specimens, 81.02 and 81.03, had weights of 10g and 160g respectively. The latter also had a diameter of 9.5 cm at its widest point and has proved to be the largest specimen found to date at this site.

It was obvious, therefore, that squirrel foraging was a sound indication of the presence of truffles and a daily watch for fresh excavations was kept at the site and its vicinity. As a result on 31 October, specimen 81.04 was found weighing 88g with a diameter of 7.7 cm. This specimen was subsequently preserved and presented to Leeds City Museum for the herbarium of the Natural History section. On 6 November very fresh and obviously uncompleted squirrel excavations led to the discovery of the presence of specimen 81.05. This had not been exposed or damaged but the strong 'alcoholic' smell was easily detectable, even to a pair of human nostrils a few centimetres above the ground! This specimen was recorded but allowed to lie undisturbed. The soil was replaced and a small flat stone laid over to thwart the squirrel and, hopefully,

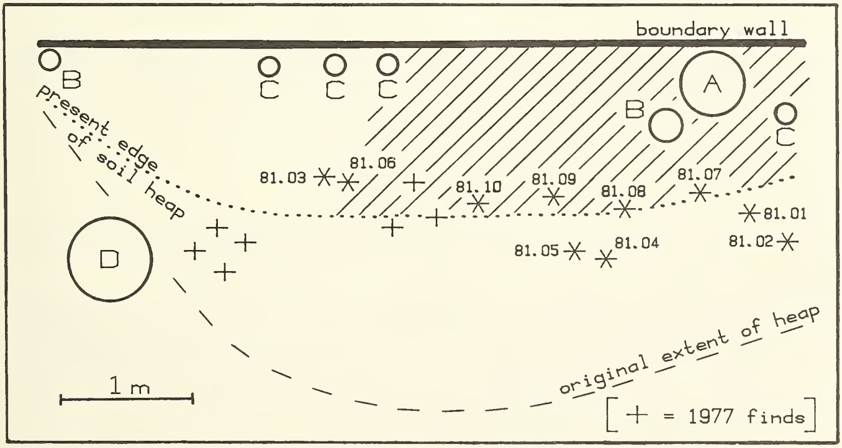

FIGURE 1

Diagram showing the position of *T. aestivum* finds at the site in relation to neighbouring tree species: A = holly, B = hawthorn, C = sycamore, D = hornbeam. The shaded area represents the extent of penetration by holly suckers.

ensure continuation of the species at this site. Continued observations revealed the final fresh specimen, 81.06, on 9 November; this weighed 129 g and measured 7.9 cm at its widest point. Remains (skin and spores) of two other specimens, 81.07 and 81.08, probably from the previous (1980) season, were also found on close examination of the adjacent hedge bottom, along with possible evidence of two more, 81.09 and 81.10.

All the locations for 1981 (Fig 1) were within 3 m of an old, well-established holly tree *(Ilex aquifolium)*. Apart from the main trunk the holly has produced numerous suckers from the ground, which form a thick hedge. Hawthorn *(Crataegus monogyna)* and sycamore *(Acer pseudoplatanus)* also form part of the hedge. In each case samples of root removed together with the truffle have proved to be of holly, thus suggesting that this could be the host species. The soil in the hedge bottom which remains from the original soil heap, through which the holly has rooted and in which the truffles have been found, now has a pH of 5.3 as opposed to 7.1 in 1977 and is often quite dry due to shelter from overhanging tree foliage. This lowering of the pH results from the removal of the lime deposits with the original heap (Preece & Redshaw, 1978) and consequent loss of the source of alkaline leaching. The diagram shows the distribution of finds and tree species within the area for the period 1977–81.

Awareness of the involvement of grey squirrels provides a new slant on truffle-hunting and also substantiates the original theory (1977) that, although it is known that they eat truffles, they could also be responsible for the dissemination of the spores. Weightman (1981) also notes the finding of a specimen in Kent which had been exposed, probably by squirrels. Although hypogeous fungi are obviously difficult to find, the search for them can be very rewarding and there is every reason to believe that many more local sites and specimens are waiting to be discovered, possibly in association with a wider variety of tree species than has been previously suggested. The present pH reading also implies a tolerance of a wider diversity of soil conditions than the traditional sites of chalk-downland beechwoods. I hope that future observations of squirrel foraging will lead to further mapping of *T. aestivum* in Yorkshire.

Acknowledgements

I should like to express my sincere appreciation to Kevin Birkby for his expert and invaluable assistance with the microscopical preparation and identification of holly roots; to Alexander Goodall for continuing daily observations at the site for me, when I was unavailable to do so myself; and to Patricia Page for her helpful comments and discussion on the text.

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BOOK REVIEWS

Barbara Nicholson's Plants of the British Isles, introduced and described by **Frank Brightman**. Pp. 77, with colour illustrations. Collins, in association with the British Museum (Natural History). 1982. £7.95.

A major feature of this book is the set of paintings which were commissioned by the British Museum (Natural History) at the instigation of Frank Brightman. Each painting extends across one and a half pages and is accompanied by a key on the left-hand margin. This layout is eminently successful: although designed as posters, the reduction has in no way diminished the fine detail and sensitivity of Barbara Nicholson's work. In all, fourteen studies of British habitats have been reproduced in this manner, each conveying a vivid impression of the typical flora, both cryptogamic and phaenerogamic, intelligently assembled to satisfy both mind and eye. It is a pity that the vignettes which accompany the text are less successful, but this loss of definition is the fault of the printing process rather than that of the artist.

Each habitat study is accompanied by two pages of informative notes, succinctly presented by Frank Brightman, who also provides a warm personal memoir of the artist which gives a

fascinating insight into the manner in which artist and author complement each other's approach to the subject; they originally met when collaborating on the production of their highly regarded *The Oxford Book of Flowerless Plants*, published in 1966, which first adopted the approach of habitat studies in plant illustration.

All-in-all, this is a memorable tribute to an outstanding botanical illustrator, and a beautiful book in its own right.

MRDS

The Bird by **Jules Michelet**. Pp 350, with 210 illustrations by Giacomelli; introduction by Philip Thody. Wildwood House, London, 1981. £4.50.

This book is a French classic, first published in 1856; the present issue reprints a translation of 1879. Philip Thody's introduction (to me the most readable part of the book) places Michelet and *The Bird* in historical context. An academic historian, Michelet found himself in political difficulties in Napoleon III's Paris and retired to Nantes, where he — or perhaps his wife — wrote fulsome books on natural history. *The Bird* was one of them. There is a feeling for natural history and a sympathy with nature — even a respect for it — that were rare in their time; these have travelled well across the decades, and Thody is right in drawing our attention to ecological insights that permeate the writing. There is also a deal of poesy that could well have appealed to contemporaries, but which I for one find ineffably trying. 'Who, then, art thou, who always concealest thyself, who never showest me ought but thy trenchant wings — scythes rapid as that of Time? But Time goes forward without pause; thou, thou always returnest. Thou drawest close to my side; it seems as if thou wouldst graze me, wouldst touch me . . .' — this and more like it on swallows. If thou enjoyest such writing, thou canst not fail to enjoy this book. The Giacomelli engravings have a muddy charm entirely in keeping.

BS

Biological Husbandry edited by **B. Stonehouse**. Pp. xiii + 352, including numerous tables, figures and b/w plates. Butterworths. 1981. £25.

A well edited volume, containing most of the papers presented at the first international symposium of the International Institute of Biological Husbandry held at Wye College on 26–30 August 1980.

The volume is divided into five sections — soil structure; flora and fauna; agricultural methods; biological husbandry in the tropics; systems of agriculture; comparative studies — each is preceded by an editorial introduction. In addition there are two introductory chapters, a postscript on 'feeding the world', and a useful index.

The papers vary in their content and scope: five are brief indeed, being less than a page in length — one questions the wisdom of including them as their usefulness is minimal. Fortunately they are counter-balanced by several stimulating papers which will be of considerable interest to biologists, agricultural and soil scientists and conservationists.

Ecology and Rocky Shores by **Roger N. Brehaut**. Pp. iv + 58, illustrated. Edward Arnold. 1982. £2.25 paperback.

Studies in Biology no 139 of the useful Institute of Biology series, of interest to students, teachers and marine naturalists.

A Key to the Larvae of the British Orthocladiinae (Chironomidae) by **P. S. Cranston**. Pp. 152 (including 57 text figures) + 1 plate. Freshwater Biological Association Scientific Publication no 45. 1982. £4.50 paperback.

Detailed keys and taxonomic notes to the British chironomid fauna. Available from: Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP.

British Fungus Flora — Agarics and Boleti. **3 Bolbitiaceae**: Agrocybe, Bolbitius & Conocybe by **R. Watling**. Pp. 139, including 13 pages of line drawings. Royal Botanic Garden, Edinburgh/HMSO. 1982, £8 paperback.

Authoritative taxonomic treatment of 17 *Agrocybe* spp., 5 *Bolbitius* spp. (including *Pluteolus*) and 58 *Conocybe* spp.

The Spur Book of Countryside Conservation by **Kev Reynolds**. Pp. 64, illustrated. Spurbooks, Edinburgh. 1982. £1.25 paperback.
A popular account of tasks at present being undertaken, or to be implemented, by the British conservation movement.

The Young Observer Action Guide compiled by **Betty James** and **Pat Salmon**. Pp. viii + 168. Allen & Unwin/The Observer. 1982. £1.95 paperback.
Useful guide to things to do, places to visit, sports and holidays in England and Wales, including reference to such topics as birds, conservation, geology and natural history.

Galapagos. Islands Lost in Time by **Tui De Roy Moore**, with an introduction by **Peter Matthiessen**. Pp. 63, plus 96 pages of full-colour photographs. Allen & Unwin. 1982. £15.
A lavish photographic record of these remarkable islands and their unique fauna and flora. Although the photography in general has both scientific and artistic merit, unfortunately the value of many plates is seriously diminished by the darkness of the printing: splendidly atmospheric they may be, but detail vanishes in murkiness. Was this the intention of the photographer or the result of the printing process?

Provisional Atlas of the Freshwater Leeches of the British Isles by **J. M. Elliott** and **P. A. Tullett**. Pp. 31, including 17 maps. Freshwater Biological Association Occasional Publication No 14. 1982. £1 paperback.
10-km square distribution maps of sixteen species of British leeches, together with introductory matter, bibliography and ecological notes, to be used in conjunction with Elliott and Mann's *A Key to the British Freshwater Leeches* (FBA Scientific Publication No 40, 1979). Available from: Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP.

An Atlas of Yorkshire Spiders by **Clifford J. Smith**. Pp. 134. 1982. £5 (+50p postage & packing), paperback; available from the author, 7 Malton Way, Clifton, York YO3 6SG.
10-km square distribution maps of 380 species, each accompanied by details of first record and concise ecological notes. Introductory matter includes a brief review of Yorkshire arachnology (unfortunately there is no bibliography) and general maps.

Wild Flower Charts. Warne. 1982. £1.15 for set of 6 small charts (22 × 32 cm); individually available as wall charts (48 × 68 cm) at £1.15 each.
Selection of attractive illustrations from Francis Rose's *The Wild Flower Key* (see *Naturalist* **107**: 38–39) representing (1) Hedge and Woodland — Spring, (2) Hedge and Woodland — Spring-Summer, (3) Downlands — Spring-Summer, (4) Hedge and Cornfield — Summer-Autumn, (5) Moor and Heath — Summer-Autumn, and (6) The Seaside — Summer-Autumn; each illustration, which is actually more sharply defined than its counterpart in the original book, is accompanied by a useful habitat code.

British Planarians by **Ian R. Ball** and **T. B. Reynoldson**. Pp. viii + 141, including 36 line drawings. Synopses of the British Fauna No. 19. Linnean Society of London/Cambridge University Press. 1981. £16 hardback, £6.95 soft covers.
Detailed keys and notes to the identification of all the known species of British planarians (Platyhelminthes: Tricladida); clear illustrations of internal and external features, glossary and extensive list of references also provided.

Historical Plant Geography by **Philip Stott**. Pp. xiv + 151, including numerous maps, line drawings and b/w plates. Allen & Unwin. 1981. £12 hardback, £5.95 paperback.
A basic and lucidly-written introduction to a traditional subject currently revived in the light of the increasing popularity of ecology and environmental sciences. Further scope for study provided by useful reference lists to each chapter and a bibliography of almost 300 titles. The book will appeal to amateur naturalists as well as students.

THE ROYAL SOCIETY CONVERSAZIONE, 1982

The Royal Society Conversazione this year celebrated two anniversaries, the semicentenary of the discovery of the neutron and the centenary of the death of Charles Darwin.

The first review exhibit included the apparatus in which Chadwick first demonstrated the existence of neutrons, and went on to explain many later developments, including some very recent ones. The introductory section, dealing with the speculations of physicists in the 1920s, was entitled 'prehistory of the neutron', a phrase that seems rather odd to a naturalist used to somewhat longer perspectives.

Darwin was much more aware of the real difficulties facing his theory of evolution than were his contemporary critics, and the two most important problems, namely the mechanism of inheritance and the explanation of apparently long-distance dispersal, gave him insuperable difficulties and were not solved during his lifetime as the necessary fundamental data were not available. He would have been interested to learn of the successful transfer of a gene from one species to another that was reported in one of the exhibits. The rabbit B-globin gene has been transferred into mice, when it became integrated into the host chromosomes and was transmitted at least to the next generation.

The explanation of many cases of apparent long-distance dispersal is to be found of course in the long-term horizontal movements of parts of the earth's crust which are now well understood and schematized in the theory of plate tectonics. The Darwin Centenary review exhibit included a report of the dramatic confirmation of Darwin's explanation of the development of coral reefs and the fact that reefs rising from the deep ocean are built by shallow-water corals. The application of plate tectonics to recent data obtained by deep-drilling on several Pacific atolls provide explanations of the changes in sea-level relative to the coral reefs that were postulated by Darwin. The most popular section of the review exhibit was, perhaps inevitably, the one concerned with Darwin's work on the expression of the emotions in Man and animals, because it included a video programme of face and head signals made by various races of Man and by animals as well. Recent studies have confirmed Darwin's view that conveying information by such gestures has to be learned in each generation as does a language. Other sections showed the firm foundations Darwin laid in the study of the ecology of earthworms, movement in plants and the classification of barnacles. Modern 'zero cultivation/direct drilling' method of cultivation of cereals have now been shown to depend for their success on the activities of earthworms; studies in the circumnutation of plant stems are being extended in conditions of free-fall on 'spacelab' flights; and biochemical genetics is shedding light on the taxonomy of the Cirripedia.

FHB

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PAGE CONTENTS

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 17p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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YORKSHIRE'S ROLE IN THE ORIGIN OF SOME NATIONAL SOCIETIES: MEETING OF THE SOCIETY FOR THE BIBLIOGRAPHY OF NATURAL HISTORY AT THE UNIVERSITY OF BRADFORD, 1981

compiled by

M. R. D. SEAWARD

On 21 November 1981 the Society for the Bibliography of Natural History held a regional meeting at the University of Bradford. A full day's programme for thirty members and guests on 'Yorkshire's role in the origin of some national societies' comprised a lecture and discussion session in the University's J. B. Priestley Library in the morning, followed by a splendid buffet luncheon, and visits to the Pharmaceutical Society of Great Britain's Collection of Crude Drugs and Herbaria, at present housed in the University, and to the Natural History Collection of the Leeds City Museum in the afternoon.

The Pharmaceutical Society's Collection was established in 1842, but not until 1872 when Edward M. Holmes (1843–1930) was appointed to the curatorship did it expand significantly: during the next fifty years under his guidance it functioned as a centre of research and reference. Besides contributing about 350 articles on drugs in the *Pharmaceutical Journal*, Holmes will be remembered for his major contributions to cryptogamic botany (particularly lichens, bryophytes and marine algae — see *Bot. J. Linn. Soc.* **67**: 1–102, 1973). He was referred to as '. . . a rapid and indefatigable walker, his quick sight detecting plants as he was racing along at five miles per hour'; he collected extensively until he lost a foot in an accident in 1922.

Further additions to the collection were received from the Paris Exhibition 1878, Indian and Colonial Exhibition 1886 and Wembley Exhibition 1924. An outstanding addition was the Hamburg collection (550 specimens and 610 herbarium sheets). Under Holmes' supervision the range of herbarium sheets of British and foreign plants was greatly extended.

On Holmes' retirement in 1922, Professor H. G. Greenish became Director until T. E. Wallis was appointed Curator in 1927. Wallis, who used the Museum to develop analytical and quantitative microscopy techniques, retired in 1949 and was followed by Dr J. M. Rowson, but Dr Wallis returned as Emeritus Curator from 1957 to 1969.

In 1947 an important collection of drugs was presented by the Royal College of Physicians. Research workers, at home and overseas, have also donated material. The collection includes specimens used in formulating drug standards for the *British Pharmacopoeia* and *British Pharmaceutical Codex,* providing a useful set of authentic standards for importers and wholesalers.

The present collection comprises 10,250 specimens of crude drugs and 9,290 herbarium sheets of medicinal and poisonous plants, and British plants, including 610 sheets from the Hanbury collection. Included in the collection are specimens of roots, leaves, stems, seeds, fruits, gums, balsams, resins, etc., collected by many people (including Richard Spruce, Robert Bentley, Daniel Hanbury, and Edward M. Holmes).

The most recent Curator of this important collection is Dr W. E. Court, and the participants of the meeting were most grateful to him for demonstrating many aspects of the fascinating contents.

The Leeds Philosophical and Literary Society founded a Museum in 1821 when the Society's private collections were opened to the public. From the 1821 Annual Report it can be seen that amongst the early exhibits there was a collection of British Birds and Quadrupeds — a gift of John Atkinson. During the century the collection grew and developed in relation to the members' interests and their generosity in making donations or raising money in subscription funds to purchase specimens or collections. In 1921, by legal agreement, the management of the Society's Museum was transferred to the Corporation of Leeds and it became the Leeds City Museum.

In 1941, the Museum building in Park Row was badly damaged by a bomb which fell through the Natural History Galleries and the storage area. Besides the destruction of part of the collections, many of the detailed natural history records were lost. Considerable damage was caused to the foundations of the building, which eventually led to its closure and the removal of

the collections and displays to their present home in the Municipal Buildings. Since Local Government reorganization in 1974, the Museum has been a division of the Leisure Services Department.

In 1825 the Council of the Philosophical and Literary Society decided to appoint a sub-curator on a salary of £80 per annum, and his duties were specified as 'to arrange the Museum under the direction of the Curator, to accumulate, preserve and label subjects in Natural History in order to render the collections not a resort for the gratification of curiosity but a valuable school of instruction'. Henry Denny was appointed and served the Society for forty-five years. Under Denny the Natural History collections were increased and developed to include not only local and British material, but also foreign specimens, e.g. a large collection of marine animals from the Zoological Station in Naples. Unfortunately, much of the pre-Second World War material was destroyed by the bomb in 1941. To protect some of the more valuable scientific material from further damage, such collections as the Lt.-Col. F. C. Fraser Collection of Dragonflies worked on by W. D. Hincks, and various other type and figured specimens were donated to the British Museum (Natural History). Some material was also passed to other museums, notably Manchester Museum.

In 1952, John Armitage was appointed Keeper of Natural History and had the task of examining and sorting the war-damaged collections. Much of these collections proved to be in very bad condition, being either smashed or infested, so that many items had to be destroyed. However, parts of the collection were salvaged, e.g. most of the insects from the Dibb and Hincks Collection, various mammals, parts of the bone collection, and most of the bird skins and mounts. The latter included the collection of Sir William Milner which contains many rare birds taken in Yorkshire, Britain and throughout Europe. The main collections of the Leeds City Museum have been acquired since 1945.

In 1946, G. R. Dent presented the Museum with a cabinet of eggs from the W. Schluter Collection of Halle, which was combined with the T. G. Roper Collection in 1947. Various other egg collections, including those of G. C. Cayley and F. H. Woodhouse, were acquired in the early 'fifties as a result of the Protection of Birds Act.

With the assistance of local entomologists, in particular J. F. Flint, a comprehensive collection of British Beetles was accumulated. This, together with some Dibb and Hincks material, and the Curculionides from the C. D. Day Collection (acquired in 1960), now forms the basis of the beetle collections.

To build up the collections, the Museum made various appeals which resulted in the donation or purchase of specimens ranging from single items to large collections such as the Wilding Collection of British Butterflies and the Thornton Collection of British Moths. In recent years the acquisitions have been orientated towards smaller collections of items such as Fish Otoliths and Woodlice. However, the following large collections have also been acquired: the L. W. Stratton Shell Collections, 263 mounted birds from Swindon Museum, and the Herbaria of James Abbott, F. W. Barnett, C. W. Horrell and Dr G. Nelson.

At present the department is investigating the historical collections and transferring these and other records onto the MDA system. In addition to this work, the collections are being enlarged as and when material is available, through purchase or donation, and by limited fieldwork.

The meeting was most fortunate in having the present Keeper of Natural History, Mr A. Norris, to show participants around the collections.

An informative and lively lecture and discussion session, under the chairmanship of Dr M. R. D. Seaward, was based mainly on a range of papers revealing the influential role of Yorkshire naturalists in the origin of numerous national societies and bodies directly or indirectly involved in various aspects of natural history. The major part of the meeting's proceedings is embodied in the following six papers.

YORKSHIRE AND THE ORIGINS OF THE BOTANICAL SOCIETY OF THE BRITISH ISLES

D. E. ALLEN

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The Botanical Society of the British Isles traces its descent — admittedly, by a not wholly legitimate route — from the comparatively short-lived Botanical Society of London, which came into being almost a century and a half ago, in 1836.

At that time the new middle classes brought into being by the decades of industrialism had begun to arrive on the scientific scene, but were finding themselves excluded from the established London societies. In part this was simply because of prohibitively high subscriptions, but there was also, more deeply, a tacit reluctance by these bodies to admit to membership those whose social status was insufficient to make up for an inadequate scientific reputation. For these societies, most notably the Geological and the Linnean, were the redoubts of the leisured gentlemen-amateurs who saw themselves in the likeness of their seventeenth- and eighteenth-century *dilettanti* ancestors. They enjoyed being seen as an exclusive fraternity, to which it was a far-perceived honour to belong; and they had no intention of undermining this carefully preserved platform of esteem by admitting the socially unprestigious, however meritorious these might be from the standpoint of learning.

One by one, accordingly, a whole new layer of societies began to come into existence. These were characterized by low subscriptions, a lack of exclusiveness, a general informality and an emphasis on mutual aid. The inner coteries who founded and subsequently ran them were typically progressive in their politics, even to the point of radicalism. Many of the more prominent members, indeed, were active in the reform movements of the period (and it must be remembered that 1836 was only four years after the eventual passing of the Great Reform Bill). Many were also from the social margins by reason of their religious beliefs, like the Unitarians and the Quakers. Such people predictably imported advanced ideas, which made these societies in some ways startlingly far ahead of their time. The Botanical Society of London, for example, proclaimed itself from the first as open to women on exactly the same terms as men, an unheard-of innovation. Disappointingly few of the numerous women botanists of the day responded to this gesture and those that did never rose to the heights of being elected to the Council or even delivering a paper, at any rate in person; but in the course of the twenty years of the Society's existence at least thirty-three were attracted to enrol and constituted thereby no insignificant proportion of the membership.

The concept of a society without premises or property, held together instead by a programme of meetings in the field, at that time still lay in the future (though it had already had its birth, in Berwickshire, five years before). Despite their posture of anti-grandeur, therefore, it did not occur to most of the new bodies to do other than imitate their predecessors in hiring a set of rooms and a paid curator, holding regular lectures throughout the winter months, and starting up a library and a museum. Evidently these were seen as essentials without which it would be indecent to ask for subscriptions. But they were all the same costly liabilities, which clashed with the societies' equal concern to keep as low as possible the barriers to membership. For the Botanical Society, in particular, this built-in conflict of aims was eventually to prove its undoing.

The Botanical Society differed from its various Metropolitan sisters in having saddled itself with one further ambitious and onerous service. This was its scheme for the organized exchange of herbarium specimens. Modelled on an earlier German initiative which had been operated commercially, this had been from the first the much-trumpeted centrepiece of both this London society and its Edinburgh counterpart, which had been founded just a few months ahead of it. The Edinburgh society, which was always the grander of the two and the more scientifically respectable, made a much greater success of its exchange activities initially; but then it grew slack and began sending out specimens (e.g. Swiss alpines) to the more discriminating members which they rated a meagre return for their money, if not indeed downright insulting. One of those alienated by this deterioration was H. C. Watson, then in the early stages of his lifelong work on British topographical botany and newly settled in the south, in north Surrey.

Contemptuously turning his back on the Edinburgh society, Watson decided to take in hand the exchange scheme of its London rival and attempt to rescue it from its inefficiency. This he presently did, with widely acclaimed success. Many more joined just to obtain out-of-the-ordinary specimens authoritatively named, and year by year the membership grew and became markedly more national.

However, for members outside London there was no point in joining *unless* they were active collectors; the Society had early abandoned printed proceedings and treated the privately-owned magazine *The Phytologist* as in effect its journal, and there was no other privilege of membership to be had by those whose communication with London could never be more than postal.

Not surprisingly the sixteen residents of Yorkshire who joined in the course of those twenty years — out of a total of some 400 — were almost all established collectors of a certain degree of prominence. All of them without exception were men: patriarchal Yorkshire was not a promising recruiting-ground for intellectually forward women. 'Recruiting,' moreover, is the operative word; for the Society set much store by the hoped-for efforts in this direction of those members who agreed to their names appearing as 'local secretaries'. There were three of these for Yorkshire: Roberts Leyland of Halifax, John Tatham of Settle and James Ward of Richmond; but if they ever recruited in the county, they must have done so largely if not wholly by correspondence, for the sixteen Yorkshire members were extraordinarily scattered, and this suggests that Yorkshire botany at that period was hamperingly atomized.

At York at least one would have expected a certain cluster of collectors, for its Philosophical Society was engaged then in building a considerable herbarium. However, although its long-serving honorary botanical secretary, O. A. Moore, reputedly put in a great deal of toil to this end, whether he even went so far as to enrol in the Botanical Society is doubtful at best. The Philosophical Society's herbarium (now in the Yorkshire Museum) does contain numerous specimens which can only have been obtained through the Botanical Society's exchanges (even though none of them now bear labels to this effect); but the evidence points to these all having come with the collection of Samuel Hailstone, a wealthy Bradford solicitor, which was presented in 1859, some years after his death.

* * *

From Yorkshire, the Botanical Society clearly had a different look than it did from close at hand. It must therefore have come as a decided shock to all the members there, as in other parts of the country at a distance from London, to receive a circular in November of 1856 announcing that a resolution had been passed dissolving the Society and that all its property was to be sold 'in order to raise a fund for paying the arrears of rent and other outstanding claims'. Some years earlier, a watchful observer might have noticed some ominous portents of this. In 1852 the reports of the meetings suddenly became sporadic in their appearance; and not long after completely ceased. Presently subscriptions were no longer being collected either. Even though the annual exchanges continued without a break, almost all the specimens for these were latterly contributed by J. T. Syme, the paid Curator, or by Watson himself, who as the scheme's original inspirer might be said to have had a particular interest in ensuring its continuance.

What exactly had happened remains a great mystery. There is an obvious conspiracy of silence about it in the contemporary literature and correspondence. From the few slight clues that have come down to us it is apparent that there was a serious neglect of duty by the hitherto highly diligent honorary secretary, G. E. Dennes; furthermore, at the same time, a long-threatened split took place between those members who saw the main value of the Society as lying in its meetings and in its London facilities and those who wished to concentrate exclusively on the one activity that had proved scientifically useful, namely the annual exchanges, which could be run on a purely postal basis at trifling expense.

The Society's demise presented this latter party with their opportunity. But month after month of 1857 slipped by and the successor society, devoted solely to the exchanges, that was reportedly being planned kept on failing to make its appearance. Around October, therefore, one of the keenest of the former exchange members, J. G. Baker of Thirsk, came forward and volunteered to keep the service going within the framework of his local natural history society,

until such time as the new national body was off the ground. Baker was the coming young man of British field botany at that period and must have seemed the ideal person for the task. A Quaker by upbringing, he ran a large wholesale draper's-cum-grocer's business in Thirsk, near the chemist's shop of his great friend and fellow botanist, William Foggitt.

That November at its fifth annual meeting, with Baker in the Presidential chair, the Thirsk N.H.S. duly passed a resolution establishing the necessary society-within-a-society and creating a new category of Corresponding Member, whereby non-locals were able to join the Thirsk Society without being charged the normal entrance subscription. Thus, in admirably flexible style, the 'Thirsk Botanical Exchange Club' entered upon what was to prove — contrary to Baker's original expectation — an existence of eight years. For it quickly attracted a strong following among the country's leading collectors (most of them, very probably, ex-Botanical Society members) and Baker ran it so efficiently that no one saw any need to pursue an alternative initiative. Even so there was no getting away from the fact that it was an organizational oddity — a cuckoo of (in the end) fifty members, of whom the non-locals outnumbered the locals by six to one — and, perhaps not surprisingly, its name tended to appear in inverted commas when mentioned in the literature.

Then, quite suddenly, on 9 May 1864 disaster struck again. A fire broke out that night which completely devoured Baker's home and business premises — and, had it not been for the cries of his three-month-old baby, he and his wife would even have lost their lives. Almost everything they possessed was destroyed, including Baker's rich herbarium and library, the stock of the first edition of his *North Yorkshire* Flora (which consequently became a book-collectors' treasured rarity), two other Yorkshire herbaria that were on loan to him for study, and many thousands of duplicate specimens of rare and critical British plants that belonged to the Club.

The botanical world responded magnificently. A fund was raised to repair some at least of the financial damage; and William Borrer, the well-to-do Sussex botanist, extended practical help by employing Baker to help arrange his cryptogams. It was while engaged in this, a full eighteen months after the fire, that he received an approach from Sir William Hooker about an opening at Kew. 'I expect soon to be in need of a person of *careful*, *neat*, *accurate* and *industrious* habits, who has made some progress in Systematic Botany and is really fond of the pursuit', Hooker wrote. Baker was all of these, and very soon the job was his.

On his removal to the South, the Thirsk Society came to an end. Once again, however, care was taken to ensure that the exchange activity was kept going and, under the new name of the London Botanical Exchange Club, this continued much as before from Baker's home down in Surrey, at Richmond. The one difference was that half of its members immediately dropped away, including virtually all of those who were resident in Yorkshire. The county had not really deserved the Exchange Club in the first place: it now turned its back on it conclusively.

This was not the last that the Club was to see of the North, even so. For thirteen years later, in 1879, Charles Bailey took on the Secretaryship and for a lengthy period its base became Manchester. In 1903 Bailey was succeeded by a retired Oxford chemist, G. C. Druce, and from that point on it speedily changed its character, expanding into a society of a broader kind and preparing to become the part-professional, part-amateur body, over 2500 strong, that is today's Botanical Society of the British Isles.

THE BRITISH MYCOLOGICAL SOCIETY: THE YORKSHIRE CONNECTION

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The origin of the British Mycological Society is very well documented and interesting accounts of that significant foundation meeting in the Londesborough Arms, Selby and its consequences are given by Ramsbottom (1948a) and Blackwell (1961b). This paper pays more attention to the actual personalities involved in the foundation of the 'National Mycological Union', the name

first proposed, and shows how had there not been a clash between two important protagonists, a Yorkshire fungus flora, with records of fungi rivalling those of any area of comparable size in the world (Wager, 1905), might never have seen the light of day.

In 1867 Dr H. G. Bull, Curator of the Hereford Museum, who had only just taken up the study of mycology, persuaded the Woolhope Naturalists' Field Club, based on the museum, to make fungi their special study. For many years thereafter the 'Club' held an annual autumn meeting to collect fungi. This meeting was brought to the attention of the general public in several published cartoons; one such illustration by W. G. Smith, a journalist, professional artist and very competent mycologist, appears in the *Pictorial World* for November 1877; it depicts collecting activities and the banquet in the Green Dragon Hotel, Hereford which always followed the foray. Foreign visitors were often present at the foray; in the 1877 illustration two distinguished foreign visitors, Professor M. J. de Seynes and Dr M. M. Cornu, are prominent. It was no doubt at this time that the term 'fungus foray' was coined and is attributable to correspondents of the Woolhope Club (Blackwell, 1961a).

The Woolhope Club kept mycology alive until the formation of the British Mycological Society. The Hereford foray 'monopolized' the first week in October for just over twenty years and was universally acclaimed as the meeting place for all interested in mycology, both British and foreign. Bull died in 1886 and the 'steam' was taken out of the forays although Mordecai Cubitt Cooke, who attended his first Woolhope foray in 1871 and whose *Handbook of British Fungi* (1881) gave encouragement to the attenders, became the natural successor. The forays ceased in 1892 because of several 'lean years', although Massee is recorded as having collected with two others at a foray of the Hereford Natural History Society in 1895 (Anon. 1895).

In 1877 the Yorkshire Naturalists' Union was formed by extending the West Riding Consolidated Naturalists to cover the entire county. The Reverend William Weekes Fowler, in his inaugural presidential address to the Union, urged that more attention should be paid to Yorkshire fungi. Within the Botanical Section of the Union at this time three were suitable candidates to take up the challenge: C. P. Hobkirk of Huddersfield, Dr H. Franklin Parsons of Goole and William Denison Roebuck, then Secretary of the Union. Other Yorkshiremen interested in fungi at that time were George Brook of Huddersfield, Thomas Hick of Leeds, William Norwood Cheesman of Selby, later to be a President of the British Mycological Society (1925), and William West of Bradford.

It is perhaps not widely known that although West was primarily an algologist and not a mycologist he actually played a very important part in the history of British mycology. It was he who introduced to the Union one George Edward Massee of Scarborough, destined to be an eminent mycologist. By 1881 this same George Massee was acting as full Cryptogamic Secretary of the Union and in 1882 founder member and secretary of the Scarborough Field Club. In 1881 he was also the principal organizer of the first Yorkshire meeting held exclusively for the study of a single branch of natural history — mycology. Three knowledgeable and notable visitors attended this meeting which was held in Leeds: Dr C. B. Plowright of King's Lynn, W. Phillips of Shrewsbury and the Reverend J. E. Vize, Montgomeryshire.

The idea of a foray had come from Massee, who recognized the growing interest in fungi and the desire to obtain a better knowledge of them: the Woolhopeans were active and the Cryptogamic Society of Scotland had been founded six years earlier (Noble, 1975; Noble, 1978). The meeting was accompanied by a 'show' open to the public and a feast at which some of the fungi collected were eaten. The fourth foray was held in 1884 in Selby, a town which was to be of significance later in our story; Henry Thomas Soppitt attended as a leading collector (Anon., 1898) and Dr Charles B. Plowright as referee (Anon., 1909). Dr Plowright was Medical Officer for Health, Lynn Rural District Council and Hunterian Professor of Comparative Anatomy, Royal College of Surgeons, London. He was also a Woolhopean and well known for his compilation of records of 800 Norfolk fungi.

It was not until seven years later, however, that the meetings of the Yorkshire Naturalists' Union were expanded to incorporate a full day to collect fungi. A nucleus had formed of members who regularly worked together on excursions. To this group many others were gradually added, including Alfred Clarke of Huddersfield and Charles Crossland of Halifax. The latter was introduced by Clarke to the Union but was soon to outpace him in mycology as he was

taken under the wing of George Massee. Although great friends, all three differed considerably in background and personality.

This group of Yorkshiremen grew as a result of the interest created by the publication of Massee's *British Fungus Flora* (1892–95) and their meetings became a feature of the annual calendar, both nationally and internationally. This expansion was not achieved by the Woolhope Club which, although it had started the trend, had difficulty in maintaining support; it was eventually taken over by the Yorkshire mycologists, who were ambitious of forming a national society (Crossland, 1908a). The 119th meeting (1895) of the Union was well organized by Alfred Clarke, being held in Huddersfield under the Chairmanship of W. W. Fowler. It was felt to be a rather special meeting, and 'it was gratifying to notice the welcome presence of several Woolhopeans who acknowledged that the Yorkshire gathering is a worthy successor' (Crossland, 1896). After tea the main characters of the drama which was to unfold were photographed together, with the exception of Alfred Clarke who was taking the picture. The photograph has been reproduced several times in various publications (Ramsbottom, 1915; Blackwell, 1961b; Blackwell, 1966) and depicts C. Crossland, M. C. Cooke, Carleton Rea, G. Massee, Rev. W. W. Fowler, and James Needham.

We can only guess what went on at the meeting at 16 St Andrews Road, Huddersfield; there is little doubt that the stage was being set for a national society to be proposed at the next Yorkshire foray. In 1896 W. N. Cheesman, who had learned the drapery trade in London and joined his uncle in a large drapery establishment in Selby, was in charge of organization. Forays were held in Escrick Wood, Blackwood and Osgoby Wood, Cambleforth and Carlton Wood, with headquarters at the Londesborough Hotel. An exhibition was organized by A. Clarke and Harold Wager; Wager was elected a member of the Yorkshire Mycological Committee at that meeting; he subsequently became President of the British Mycological Society in both 1910 and 1919. Over a cup of tea in Cheesman's house the great decision was made and in the hotel that day the British Mycological Society was born. George Massee was proposed as President, Charles Crossland as Treasurer and Carleton Rea as Secretary. Immediately after the Selby meeting the mycologists went on to join the Lincolnshire Naturalists' Union, which the Rev. W. W. Fowler had founded three years earlier, on their foray around Grimsby. Perhaps this should be recognized as the first British Society foray!

Thus the society had been conceived in the Midlands but was firmly born and cradled in northern England.

The society was formed with the aims of holding an annual autumn foray for one week's duration in a new locality each year and the publication of an annual report and résumé of work dealing with mycology undertaken in Britain and on the Continent. The production of a publication was spurred on by the fact that M. C. Cooke's journal *Grevillea* had ceased to function in 1894, even though Massee and Batten had saved it for one year and edited volumes 21 and 22. The French Mycological Society founded by Lucien Quélet, J. B. Mougeot and Narcisse Patouillard had already been active for ten years and first published its journal in 1885. The British mycologists had to wait until 1897 to see the first volume of their Society's Transactions, which was edited by C. Rea; it was perhaps the fact that Rea was doing this as well as acting as the Society's secretary that produced the rift. This was compounded by the fact that Charles Crossland after only one year resigned as treasurer 'in order to save the Society money' and Carleton Rea took the powerful post of treasurer-secretary.

The picture at Huddersfield looked tranquil but soon there were to be storm clouds. But what of the 'Gang of Seven'?

The Catalyst: Reverend (later Canon) William Weekes Fowler (1835–1912)

Fowler was not exclusively a mycologist, being interested in all aspects of natural history, but because he had always encouraged the study of the lesser known groups of organisms he soon came in contact with the mycologists. It was with some interest therefore that he saw the development of the subject in Yorkshire and the stage set for the final scene.

The Mycological Committee was formed in 1891 at the Doncaster meeting and it was Fowler who was its first chairman; indeed only Fowler and two others, G. Massee and H. Wager, chaired the meetings over the next thirty-year period. The aims of the committee were:

'. . . a desire to supplement the somewhat scanty knowledge of the mycology of the county'
'. . . to provide earnest working mycologists in each of the Ridings'
'. . . to meet the desire of a few mycological members of the Union for mutual intercourse'

The Expert: Mordecai Cubbitt Cooke (1825–1914)
If the Rev. Miles J. Berkeley was the father of British Mycology, Cooke was its benefactor and popularizer, writing easily read and plain accounts of both macro-fungi, e.g. *Handbook of British Fungi* (1881), and micro-fungi, e.g. *Rust, Smut, Mildew and Mould* (1865). He was born at Horning, Norfolk and became one of Britain's best known mycologists. He was a strong Calvinist, but 'genial and of fine wit'; starting as an apprentice in a wholesale linen establishment he soon left it to work in London as a copying clerk. From this modest beginning his activities extended into many spheres. He was a founder member for instance of the Quekett Microscopical Club, at which time he began to aspire to a real knowledge of fungi (English, 1978). He corresponded with the Rev. M. J. Berkeley and Dr C. E. Broome, and gained their friendship and assistance. His life has been researched fully by Dr Mary English of Bristol (see Bevan, 1981); a long obituary was contributed by Ramsbottom (1915). He was mycologist at Kew, with G. Massee as his assistant. He was quite elderly when the British Mycological Society was formed and although publishing articles in their Transactions, he played a minor role in its organization, leaving the platform to his more flamboyant colleagues, G. Massee and C. Rea. He travelled to Perth for the inaugural meeting in 1875 of the Cryptogamic Society of Scotland and made many friends therein.

The Rebel: George Edward Massee (1850–1917)
Massee was born the son of a Yorkshire farmer and was expected to have taken over the farm at Scrampeton; however, he was more interested in drawing, attending the York School of Art, where he gained a national medal. He went to Cambridge but apparently was sent down for throwing a professor into the River Cam — a preview of what was to come? After this period he had many jobs, farming, footman at Rillington House and even, it is said, a soldier in the Foreign Legion (Blackwell, 1961b). He was, however, taken in hand by a relative of his mother, Richard Spruce, an eminent botanist (Sledge, 1971); indeed Spruce probably played a part in moulding young Massee's future and that of British mycology.

With newly acquired training in physics and chemistry he left for the Caribbean to collect orchids on Spruce's recommendation, because of the latter's belief that every botanist should have training in the tropics. On his return he took up a post as assistant to M. C. Cooke at Kew, and later succeeded him as chief mycologist. Massee was a brilliant but impetuous and often careless man. Ramsbottom (1917b) writes 'If he had any capacity whatever for taking pains he would have been a genius'. He often criticized people in areas in which he had no experience and was led to do and say things he really should not have. A description of him dressed as 'a dandy with elegant check jacket, low starched collar, bow tie and tie pin' gives some illustration of his defiant character.

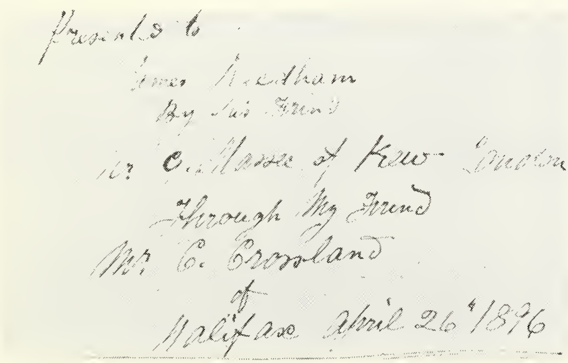
The Organizer: Charles Crossland (1844–1917): see Ramsbottom (1917a)[1–4]
Crossland was born in Halifax and worked for some time in his parents' grocery business; he was then apprenticed as a butcher and after a period in his own shop at Wyke returned to Halifax where he opened a butcher's shop. Soon after his return he took an interest in place names and was a founder member of the Yorkshire Dialect Society. He was a well thought of member of the community, being a treasurer of the Halifax Butchers' Association 1881–1908 and a prominent member of the Halifax Antiquarian Society; his interest in biology was only stimulated after helping his daughter prepare for a Sunday school wild flower prize. He joined the Halifax Scientific Society, and ultimately teamed up with A. Clarke. He attended his first foray in 1888 and here he met George Massee, who persuaded him to take up mycology; the meeting was the beginning of a long collaboration between the two men.

During the early period of his natural history studies, Crossland and his friends took examinations in plant physiology and morphology to widen their knowledge, so although

originally lacking in scientific training, he bettered himself, persevered, and made faithful observations and reliable and exact records. Crossland was secretary of the Mycological Committee in 1892, and President of the Yorkshire Naturalists' Union in 1907, when his address was on Yorkshire mycology (Crossland, 1908) and particularly James Bolton (Crossland, 1910; Watling and Seaward, 1981). He collected with H. T. Soppitt when the latter settled at Clover Hill in Halifax and they published jointly; this and other material, including paintings, formed the nucleus of the British collections of fungi at Kew.

The Collector: James Needham (1849–1913): see Crossland 1913[5]
'The tooad-stooil man' was an iron-moulder by trade and joined the Hebden Bridge Literary and Scientific Society in his late thirties, specializing in mosses and liverworts. He soon became an expert in finding the right ecological niches for rare species and was subsequently much sought after as a bryological guide, often for financial reward, even though by 1889 he had already met C. Crossland and had been introduced to fungi. He took up their study in addition to the bryophytes and in 1892 attended his first foray. With his rather parochial interests he probably played the smallest part in the discussions on the possible formation of the national society but because of his great ability as a collector his opinions were always valued: indeed it was people like Needham on whom professionals like Massee and Cooke depended. He collected many interesting fungi, some new to Britain and some even to science, on his long often early morning walks in his home area of Hebden Bridge. In fact he put this small Pennine woollen town on the mycological map. He was a wiry, quiet man of pleasant disposition, anxious to help and give encouragement, but amusingly frank.

Needham was very close to Crossland, and by 1894 a Yorkshire mycological trio had formed: the professional (G. Massee), the middle-class naturalist (C. Crossland) and the amateur working-class field naturalist (James Needham). This is examplified in a dedication (see below) in a copy of a revision of the Genus *Coprinus* (I).


Presented to
James Needham
By his Friend
Mr G. Massee of Kew Museum
Through My Friend
Mr C. Crossland
of
Halifax April 26/1896

The Recorder: Alfred C. Clarke (1848–1925): see Mason, 1925; Blackwell, 1961b[6]
As a young man Clarke came to Huddersfield from Winchester; he worked as a chemist and enrolled as a student at the Mechanics' Institute. Clarke taught chemistry in the evening in schools in the area and carried out consultative work. His wide interests made him an admirable secretary to the Raistrick and Brighouse Natural History Society, although he soon specialized in fungi. Clarke was a photographer, introducing many interesting and innovative techniques; whilst President of the Huddersfield Naturalist Society in 1886 and Secretary from 1891 to 1899, he was instrumental in uniting the Huddersfield Naturalist and Photographic Societies. Although a very good field mycologist, Clarke is best known for his meticulous records. He probably had less interest in what the records were to be used for than actually making them. It was through his thoroughness in recording fungi that it was possible for Massee and Crossland to prepare the *Fungus flora of Yorkshire* (1902–05) and 'The Catalogue' produced by Mason and Grainger (1937). Clarke was made the first official recorder of the Mycological Committee.

In 1888 Clarke introduced his friend Crossland to the Yorkshire foray, having collected with him for about six years in the Huddersfield and Halifax areas. The distance between these two towns (24 km) was nothing to these keen amateurs in the same way as James Bolton before them had travelled the old road to Huddersfield via Mills Bridge — now Milnsbridge. Needham would tramp 48 km in search of fungi and mosses; Elias Fries too considered it not impossible to walk 75 km in twelve hours in order to collect fungi (Noble, 1978). Four years after their first meeting Clarke and Crossland had produced a lengthy list of fungi; every spare moment was spent by these men and their friends on their chosen hobby of collecting and examining fungi. Even after the death of his friend and protégé Crossland, Clarke continued to record until he died, adding over 1,000 records to the original Massee and Crossland flora. It was the existence of these painstakingly prepared records that persuaded R. C. Fowler Jones to sponsor the publication of the *A Catalogue of Yorkshire Fungi* (Mason and Grainger, 1937). Clarke unfortunately was a rather impatient, unapproachable person who did not suffer fools gladly and had a dry, cynical sense of humour.

The Visitor: Carleton Rea (1861–1946): see Ramsbottom, 1948b; Pearson and Richardson, 1946. Rea was the son of a city coroner and graduated in law at Oxford. Although a barrister, he seldom practised and as he had the means he gave it all up in 1907 and was then able to spend his time on his hobby, virtually dedicating his life to fungi. Ramsbottom (1948b) suggests that if he had applied the organization, energy and efforts he applied to his mycology to his legal career it would have been a great success.

Rea is well known throughout the world as the author of *British Basidiomycetae* (1922), the preparation of which he really had forced upon him. However, he was in addition a very good flowering plant taxonomist with wide interests, reflected in his keenness to join the Worcestershire Naturalists' Club at the age of fifteen. Subsequently he was the editor of their Transactions and president for three separate periods. Both Cooke and Massee attended the foray organized by the Worcestershire Naturalists in 1892 and Rea's interest in fungi commenced there; one year later saw him attending the Yorkshire foray preceding the Pocklington meeting; at this time he was attending the Woolhope forays. His contacts with Yorkshire were also through his father-in-law John Rose, a Worcester solicitor who often attended Yorkshire Naturalists' Union meetings. Only ten years after being introduced to mycology he was attending a French mycological foray with Dr C. B. Plowright.

Rea's real contribution to mycology, however, was to mother and protect the young British Mycological Society in such a way that it prospered and blossomed into the organization we see today.

He was a keen sportsman but a cantankerous, stubborn person who terrified people and Ramsbottom (1948b) admits that he frequently had differences in editorial opinions when they were both editors of the Transactions. A description of his dress may illustrate how determined and autocratic he was: 'A panama hat, or trilby, knickerbockers, high single collar, white shirt with prominent cuffs, white tie and waistcoat and monocle . . .'

* * *

In 1897 the first **B.M.S.** foray was held in Sherwood Forest on the doorstep of Yorkshire and only a stone's throw from Herefordshire and Worcestershire. The headquarters were in Worksop (13–18 September) and Welbeck, Thoresby (and Budby Carr), Clumber and Birklands were visited.

In 1898 the foray was held in Dublin but by this time Rea and Massee had crossed swords and although it was made to appear that Massee was unable to attend a rift had developed. Both Rea and Massee had barks far worse than their bites but the clash of personalities was too great. Massee apparently thought Rea had more power as Secretary/Treasurer and Editor of the Transactions than he did as President of the society. Dr Plowright took over as President one year later.

In 1902 the British Mycological Society returned to the place of conception, Herefordshire; J. H. Trail from the Cryptogamic Society of Scotland was president and presented a paper on the distribution of flowering plants; Trail like Massee had collected in South America and

returned to Scotland after the idea of a Cryptogamic Society had been first mooted in 1874. On his return he was a tower of strength not only to Scottish but also to British mycology.[7]

The Yorkshire mycologists continued with their own forays even after Selby; thus three large forays were held annually, Yorkshire, British Mycological Society and Cryptogamic Society of Scotland. However, after the Dublin foray Massee's interests drifted north to his home county and with Crossland he knuckled down to the tedious task of preparing the draft of the *Fungus Flora of Yorkshire* Transactions of the **Y.N.U.**, as well as many other scientific publications. The Yorkshire contingency now restricted its time to recording in the county. Crossland acted as the stabilizing factor and so not only did the 'Fungus Flora' see the light of day but unlike many of Massee's other works was an accurate account of the fungi to be found therein. This was a fitting tribute to all those who had helped, H. T. Soppitt, T. Birks, H. Wager, U. Bairstow, J. W. Sutcliffe, etc. (Watling, 1961), and a worthy continuation of the study commenced by James Bolton of Halifax some hundred years earlier. Thus Yorkshire became the first county with a fungal flora of its own, to be rivalled only in recent years.

In 1910 Elsie M. Wakefield returned from Munich, where she had been working under Professor von Tubeuf, to work as assistant to George Massee of Kew. The following year on his retirement she took over his post. She joined the British Mycological Society in 1911 and A. A. Pearson joined the same year, whilst John Ramsbottom had joined in 1910 (Dennis, 1954). Pearson had strong connections with Yorkshire in both business and mycology and regularly attended the Yorkshire Naturalists' Union's Mycological Committee forays. Indeed his keys to *Russula*, *Lactarius*, *Boletus*, *Mycena*, and *Inocybe* published in the *Naturalist*, the last two edited by R. W. G. Dennis after Pearson's death, were the only modern British treatments available for many years (Watling, 1978). Wakefield, Pearson and Ramsbottom maintained the Society's activities between the wars, taking over from Carleton Rea; they served in total 131 years, frequently in dual capacities.

The British Mycological Society flowered from the initial twenty or so members who signed the roll of membership at Selby to forty-nine (+ Woolhope Club) a year later; over a quarter of these foundation members were Yorkshiremen. It soon expanded to sixty members in 1902 and one year later it had reached the limit of one hundred foundation members. The Society now has a membership of 1,562 (1,281 members) with worldwide distribution. The Society has diversified its interests and has now Physiology and Ecology sub-groups in addition to the Foray Committee which is still very active.

Just as the Yorkshire Naturalists' Union, two annual forays of 4–5 days' duration, in the spring and autumn, are held by the British Mycological Society, and in its last brochure, no less than eleven day forays were listed and fifty forays of other societies, including the Woolhope Club, were advertised. The Foray Committee holds workshops on various groups or techniques where specialists explain methods of looking at fungi, etc, just as in Clarke's day, an annual day meeting is exclusively devoted to aspects of mycological history, nomenclature, mapping, etc. The Yorkshire mycologists of the early days would have strongly supported this as they always made it their duty to help the general public to appreciate fungi and allow mycologists to have a forum for discussion, and a meeting place for the exchange of opinion and courteous criticism.

For the Jubilee foray in 1946 the British Mycological Society visited Mulgrave Woods, near Whitby, the site also of its 1904 foray, and over the years it has visited Doncaster (autumn 1914), Sheffield (autumn 1956) and Pickering (spring 1967). In 1983 York will be its rendezvous to commemorate the 100th documented foray of the Yorkshire Naturalists' mycologists.

Acknowledgements

I am indebted to all my old friends in the Yorkshire Naturalists' Union, Halifax Scientific Society, Ovenden Naturalists and Milnsbridge Naturalists, especially Frank Murgatroyd, the late H. Lawson, J. Lamb and F. Schofield. I have spent many happy times with them on field trips and usually when raining talking about the old West Riding naturalists. My particular thanks are extended to W. G. Bramley and the late Harold Walsh and Elizabeth Blackwell who encouraged me as a schoolboy and assisted me as a young man; H. Walsh introduced me to Myxomycetes and talked of his personal contacts with J. Needham and C. Crossland (Walsh, 1957), and Misses E. and L. Blackwell were kind enough to talk to me about the early

mycologists they had met, as was John Ramsbottom, during the few meetings we had towards the end of his life and Violet Astley Cooper, daughter of C. Rea who frequently attended Yorkshire Naturalists' forays.

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NOTES

1. Charles Crossland's herbarium formed the basis of the British collection of fungi housed at the Royal Botanic Garden, Kew. During the researches of Miss E. M. Blackwell and the author additional collections in the possession of J. H. Lamb, former President of the Halifax Scientific Society were located and sent to Kew. See also note 5 below. Some books formerly belonging to Crossland accompany those of H. T. Soppitt's now in the Soppitt Memorial Library at York.
2. Crossland's interleaved copy of Massee's *British Fungus Flora* with corrections and notes, some accompanied by illustrations, is housed in the Royal Botanic Garden, Edinburgh. It was found by H. J. Houghton, Gainsborough, in a secondhand bookshop.
3. Crossland's manuscript copy of Massee and Crossland's *Fungus Flora of Yorkshire* interleaved in six volumes with the printed version is at present housed in the School of Environmental Science, University of Bradford. The compilation was prepared by Roebuck and Ingle about 1911 and includes annotations.
4. An interleaved set of accounts and brochures of the Yorkshire Fungus forays with some notes by Crossland is housed in the library of the Halifax Scientific Society, Central Library, Northgate, Halifax.
5. James Needham passed most of his specimens to Crossland and/or Massee but in 1956 the author located in the attics of the headquarters of the Hebden Bridge Library and Scientific Society a small mycological herbarium belonging to James Needham. The specimens were handed over to the Royal Botanic Gardens, Kew. Material in this collection was examined by Palmer and Watling and resulted in two papers:
Palmer, J. P. (1957) The Gasteromycetes in James Needham's Herbarium. *Naturalist* **1957**: 89–92.
Watling, R. (1958) Boleti and Chanterelles in James Needham's Herbarium. *Naturalist* **1958**: 129–134.
6. Alfred Clarke's paintings, photographs, notes and mementos, including letters from M. C. Cooke, the contents of which go a long way to explain the break up between the Yorkshiremen and Carleton Rea are now housed at the Tolson Memorial Museum, Ravensknowe Park, Huddersfield. Cooke, it may be added, was apparently on the side of the Yorkshiremen.
7. J. H. Trail (1851–1919) Professor of Botany at Aberdeen University, where his herbarium is still kept in the Botany Department. It is the only herbarium known to the author which is arranged according to substrate, i.e. following an ecological arrangement.

WILLIAM INGHAM: THE YORKSHIRE CONNECTION WITH THE MOSS EXCHANGE CLUB

T. L. BLOCKEEL

Although Yorkshire played no institutional role in the origin of the Moss Exchange Club and the British Bryological Society, it would be surprising in a county which has produced so many eminent bryologists if there were no personal link with the development of the national body. William Ingham of York, however, was more than such a link: he was the leading participant in one of the Moss Exchange Club's most important undertakings.

The Club had its origin in Northern Ireland, from where Rev. C. H. Waddell advertised in 1895 and 1896 in *Science Gossip* and other journals for the formation of an Exchange Club. His initiative resulted in the enrolment of twenty-three members into the Club in 1896. As its name suggests, it had as its primary function the exchange of specimens, of which between 2,000 and 3,400 were distributed in most years. Early in its life, a separate section was formed, 'Section II', as suitable for beginners, most of the original members of the M.E.C. being already competent bryologists. The unfortunate consequence of this was to create a separate and to some extent rival Club, since the offshoot section acted more or less independently of the other and had members who were to become leading figures in the study of bryophytes. This was an unsatisfactory state of affairs. Moreover, by the time of the First World War the senior section of the Club had more or less achieved its primary objective, and, no doubt in part because of the

War, membership was falling slightly. At least one official of the Club at this time wondered whether it 'might not form a more ambitious aim, and be reconstituted in some such footing as the Mycological Society'. This was not in fact to happen until 1922, when the two sections agreed to unite as the British Bryological Society, which formally began its existence on 1 January 1923, as the direct descendant of the Moss Exchange Club.

However, the M.E.C. was always more than a mere Exchange Club. Each year a notebook was circulated, in which members inserted comments about specimens and discussed more general matters of relevance to the Club. Annual reports were printed, listing the plants submitted and including extracts from the notebooks. In this way knowledge of British bryophytes increased, though admittedly in the early years some members had to be persuaded to prepare their exchange packets more satisfactorily, and some labour had to be exercised to ensure the correct naming of specimens for the distribution.

The most lasting contribution of the Club to bryological knowledge was probably the series of Census Catalogues published by it. Naturally members who wished to build complete herbaria were anxious to have authoritative lists of what was known from the British Isles, and indeed such Catalogues had existed before the Club itself. These Catalogues were always to some extent distributional in character, but it was the M.E.C. which brought them to an adequate state of usefulness and completeness. As early as 1897, one member, E. C. Horrell, drew the Club's attention to his interest in the compilation of vice-county lists, but subsequently the leading figure in the production of the Catalogues was William Ingham.

Ingham was Secretary of the M.E.C. during the last twenty years of its twenty-seven year history, less the final few months. Born in 1854, he was educated at York Training College and London University. After taking his degree he became Organising Inspector of Church Schools in the York Diocese, and from 1908 he served on the staff of the York Education Office. He joined the M.E.C. at its inception in 1896 and was clearly one of its most active members. His contribution to the early distributions was numerically greater than that of any other member. Although in 1897 he was requesting help with hepatics, he was clearly already more than competent with mosses, and he was later to be a referee in both groups, his taxonomic expertise extending to some of the most difficult genera. He agreed to take over as Secretary of the M.E.C. in 1903, when the previous holder of the office resigned through pressure of work. It was only through illness that he himself resigned in 1922, not long before his death on 25 May 1923. On his resignation, thirty-one members of the Club contributed towards a testimonial of £31 10*s* 0*d*, as an appreciation of his services.

His interest in the production of the Census Catalogues became evident soon after he became secretary. He edited a Hepatic Catalogue, published in 1905 and compiled by the great bryologist S. M. Macvicar, though the work admittedly left 'many gaps to be filled up in the distribution in England and Wales'. In the same year he drew the members' attention to the need for a Moss Catalogue, and was subsequently to get together a committee to work on it. This Catalogue was published in 1907. By 1913 it was possible to publish a more complete edition of the Hepatic Catalogue, with Ingham as compiler. With Macvicar, he had done most of the work on which the additions were based, particularly in the laborious task of checking specimens. Ingham also checked and recorded additions to the Moss Catalogue and had an enormous number of records by 1918, when he proposed a new edition of the work. This was not in fact to appear until 1926, three years after his death.

The Census Catalogues had mixed fortunes during Ingham's lifetime: the Heptic Catalogue of 1905 sold well, but the second edition did poorly, and there was the abortive attempt to issue a new Moss Catalogue in 1918. However, their historical importance has been immense. The tradition of vice-county recording continues today — indeed this account coincides with the publication of new editions of the Bryophyte Catalogues. Recently there has also been the parallel activity of 10 km dot mapping, though the vice-county system remains the only one for which definitive sets of vouchers exist. The outcome has been more than mere dots and figures. In particular the gathering of distributional data leads to study of the causes of the patterns that emerge, and to related ecological studies. Secondly the need to fill in distributional gaps draws attention to the otherwise neglected common species, and in some cases has contributed to a clearer understanding of their taxonomy and to the discovery of new taxa. In William Ingham,

Yorkshire lays claim to a bryologist who not only contributed much to the development of the Moss Exchange Club, but also was one of the instigators of distributional studies in British Bryology.

Information about the Moss Exchange Club may be found in Armitage (1956) and Foster (1979), and about William Ingham in Cheetham (1923), Anon. (1923), and Shaw (1973). Ingham's herbarium is at the University of Leeds.

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THE CONCHOLOGICAL SOCIETY OF GREAT BRITAIN AND IRELAND: THE EARLY YEARS

A. NORRIS

Leeds City Museums

The Conchological Society of Great Britain and Ireland was founded as 'The Conchological Club, Leeds' on the 12 October 1876, at the home of William Nelson of Cross Gates, near Leeds.

In a history of the Society J. W. Jackson (1927), points out that 'this club did not come about in a spontaneous manner', but was a direct result of the publication of *The Quarterly Journal of Conchology* by John W. Taylor in 1874. This publication was produced with the assistance of his close friend William Nelson, and was designed to popularize the study of conchology. The four founder-members of the Club, John W. Taylor, William Nelson, Henry Crowther and W. Denison Roebuck had been friends for many years before the foundation of the Club, as they had all been involved in the formation of the Yorkshire Naturalists' Union in 1870.

John W. Taylor has always been considered the prime moving spirit behind the formation of the Society. Born in Leeds on 6 February 1845, he spent his life in Leeds and devoted most of his spare time to the study of conchology. A successful businessman, he owned 'The Colour Printing Works' of Taylor Brothers, Sovereign Street, Leeds, in conjunction with his brother Robert Thomas Taylor.

The foundation of the printing business in 1868 and John W. Taylor's interest in the study of conchology were very fortunate for the embryonic society. *The Quarterly Journal of Conchology*, first published in 1874, was obviously intended for circulation amongst Taylor's friends and contacts as none of its early parts were dated. However, it soon became well respected, and has since grown to what it is today, a journal with a high international standing. *The Journal of Conchology*, as it is now known (the title *Quarterly Journal of Conchology* was changed in 1879) became the official organ of the Society on 17 January 1878, but the Council of the Society did not gain control over its publication until 1894, when John W. Taylor agreed to sell the goodwill, copyright and back numbers of the *Journal* to the Society for the sum of £30.

1895 was a very eventful year in the history of the Society. T. E. Crowley in his Presidential Address entitled 'A History of the Society' (Crowley, T. E., 1975), goes into a great deal of detail about the events leading up to this time. In February 1888 a group of members met and resolved to form the 'Manchester Conchological Society' as a branch of the main Society. A deputation was sent to Leeds and the matter was considered at the Council Meeting held in April

of that year. A resolution was passed approving the formation of branches and local groups, but care was taken to ensure that they were tied to the parent body. Thus, the Manchester Conchological Society was formed.

Although on paper the Conchological Society appeared to be a healthy and growing organization with a membership of about 180, the Society had many problems. Meetings in Leeds in the late 1880s and early 1890s often consisted of only three of the four founder members as Henry Crowther had resigned in 1881 on moving to Truro as Curator of the Museum of the Royal Institute of Cornwall and a teacher at the Camborne Mining School. Crowther did, however, rejoin the Society on his return to Leeds in 1893 when he took up the appointment of Curator of the Leeds Philosophical and Literary Society Museum. In the period from 1887 to 1895 some Council meetings had to be terminated as members left, denying the meeting a quorum. Things got particularly bad in April 1889 when a joint letter was read before the Council from four of its members, all of whom resigned their positions on the Council. This appears to have led to the downfall of the Secretary, T. W. Bell, as W. Denison Roebuck was appointed in the following year.

L. E. Adams took over the position of Hon. Treasurer vacated by Roebuck, and was soon issuing warnings about the growing number of unpaid subscriptions. The publication of the *Journal* became irregular, and it soon became apparent that there was a financial crisis. It was pointed out that the *Journal* was going out to all members and that some had not paid for up to nine years, while others, listed as members, had never paid a subscription at all. As a result, the Council gave an instruction to stop the *Journal* being sent to any member who was more than three years in arrear.

It came to light, however, that one of the founder members, William Nelson, was in debt to the Society for the sum of five years' subscriptions. William Nelson was the poorest of the four founder members. He had been married twice and struggled for many years to support the children of both these marriages.

In order to get over the difficulty of William Nelson's subscriptions, it was decided to remit the debt and make him an Honorary Member of the Society. When he died in January 1906 he left a family that was all but destitute. His friends and colleagues rallied round and an appeal was made through the Yorkshire Naturalists' Union to purchase his collection from his widow for presentation to Leeds University. This collection is now in the care of Leeds City Museum.

As can be seen, a number of administrative difficulties had been allowed to develop over the years. It seems that the Society had grown to a point beyond the interests and capabilities of the Leeds group. It is not surprising, therefore, that a suggestion was made in 1895 by the Leeds members that it might be better to transfer the headquarters of the Society to Manchester, where there was a more numerous and active group of members.

The consequences of this proposal, which was made in good faith by the founder members in Leeds, could not have been foreseen. At the time, the intention was that the Leeds members would form a branch within the organization of the Society. Also, a London branch was to be formed under the chairmanship of the Rev. Canon J. W. Horsley. Thus, all was set for an amicable expansion of the Society. At this point the frustration of the Manchester contingent seems to have come to a head, after years of seeming confusion in Leeds.

As previously indicated, the Society had gained control of the *Journal* in 1894, and the move away from Leeds gave the Manchester contingent the opportunity to replace most of the officers of the Society. Thus, W. E. Hoyle who had replaced both J. W. Taylor as Editor and Henry Crowther as Librarian in 1894, was now joined by E. Collier who took over from W. Denison Roebuck as Secretary, and Robert Standen who replaced William Nelson as curator of the collections.

Thus, in a very short period of time all the founder members had been replaced as officers of the Society. The removal from office of the four founder members in such a short period of time must have deeply wounded them, as subsequent events seem to indicate.

In 1895 the new Leeds Conchological Society was formed, ostensibly as a branch of the parent Society. However, from the start it was obvious that this link was very tenuous. The Annual Report, in the Leeds Conchological Society Minute Book, dated 10 October 1895, makes the following statement:

> 'On the 10th October 1895, the Conchological Society of Great Britain and Ireland, with the goodwill of its four founder members Messrs. W. Nelson, J. W. Taylor, W. D. Roebuck and H. Crowther, all of Leeds, was transferred to Manchester, and the Leeds Conchologists were left without a meeting place, or any collections . . .'

Under these circumstances it was resolved (as had been done twenty years before) to continue the study of the Conchological Science at the houses of the members of this new society, to be henceforth called The Leeds Conchological Society.

The following statement was also read before the new Society, and it sums up the members' feelings at the time:

> 'One point may justly be raised here. At the last Annual Meeting of the Conchological Society, at Manchester, a clean sweep was made of the members of the Leeds Society from the Council. Upon that body the Leeds members have no elected member. This wholesale deleting of every founder's name was received without a protest by British Conchologists who owe their (parent) Society, its records, its journals, its collections, and its influence to them. Your Hon. Secty. under these circumstances sent in his resignation. Our Leeds members include Mr J. W. Taylor the talented author of 'A Monograph of the Land and Freshwater Mollusca of the British Isles', a work promising to be second to none in its style and original treatment of British Conchology: Mr Wm. Nelson whose scientific life study has been given unselfishly and unsparingly to Molluscs, honored by being made an Honorary member of the Conchological Society, and Mr W. Denison Roebuck, the Editor of the Naturalist; the 21-years' Hon. Secty. of the Yorkshire Naturalists' Union; the Emeritus Secretary of the Conchological Society, these, all authors, all past presidents at times Hon. Secretaries or Recorders of the parent society have not so surely lost all touch all knowledge of Conchological Science that in twelve short months they are of no use on the Council of the parent society.

Today, the Leeds Conchological Society is known as the Yorkshire Conchological Society, and although it still has this tenuous link with its parent body, its loyalties are more with the Yorkshire Naturalists' Union than with the Conchological Society of Great Britain and Ireland.

A dispute also occurred soon afterwards between the parent society and W. Denison Roebuck over the records compiled by him over the years. A new recorder, Thomas Rogers, who took over from E. Collier, requested the transfer of all the record books held by W. Denison Roebuck. Roebuck refused to do this, insisting that they were his own private property (a statement which was probably true), and he required them for reference in the production of Taylor's Monograph. Roebuck did, however, relent after a number of years and handed them over to the recorder in October 1900.

After the transfer of the society's headquarters to Manchester, The Conchological Society of Great Britain and Ireland never looked back. The London branch was founded officially in the January of 1896, followed by the North Staffordshire branch in 1914.

Although the Leeds founder members patched up their quarrel with the Society, the rift between the Yorkshiremen and the national Society was never fully healed, Henry Crowther rejoined, and eventually accepted Honorary Membership. However, even the presentation of an illuminated address to John W. Taylor on the occasion of his 70th birthday in 1915 did not seem to repair the old wounds.

In 1946 the headquarters were again moved, this time to London. The library and collections, which had been moved to Manchester in 1895, were moved back to Leeds in 1947. Unfortunately the situation at Leeds Museum in the years after the war was not conducive to the long-term storage of this material, and in 1954 the library was sold and the collections transferred to the British Museum (Natural History).

The Conchological Society of Great Britain and Ireland now produces a wide range of publications and the worldwide membership has grown to more than 600 institutional and private members. Although smaller, the Yorkshire Conchological Society has continued as an

active organization within the Yorkshire Naturalists' Union, with regular monthly meetings, and a membership of around thirty. Several of the members of the Yorkshire Society also hold office within the national Society.

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THE MUSEUMS ASSOCIATION

E. G. HANCOCK

The idea of a group of curators forming an association interested in the welfare and progress of museums, developed in the north of England, particularly Yorkshire. Henry Maurice Platnauer (1857–1939), curator of the York Museum, initiated through the Yorkshire Philosophical Society a circular to twenty-four museums. Following this, curators from Liverpool, Manchester, Bradford, Bolton, Sheffield, Warrington, Nottingham, Sunderland, and York met at the private residence of S. W. North, vice-president of the society, on 3 May 1888. A catalyst which may have influenced the timing of this was the British Association (Manchester, 1887) report by a committee on provincial museums. (This was reprinted in respect of the museums of the north of England in the *Naturalist* **1889**: 45–51). Earlier, however, Elijah Howarth (1853–1938) curator of Sheffield Museum had written a letter to *Nature* in 1877 suggesting an Association and although this received some support, it proved difficult to mobilize the widely scattered curators. It appears that the parochial arrangement was more successful in bringing a nucleus of interested parties together.

Howarth and Platnauer were both founder members, the subscription being half a guinea, and were each at various times secretary, editor and ultimately president of the Museums Association. Howarth may not have been a Yorkshireman by birth, his first post was as an assistant at Liverpool, but he certainly developed the traits of one, probably from working in Sheffield for fifty-two years. His obituary (*Museum J.* **38**: 115) says 'he always expressed his opinion with the utmost force and frankness and on that account earned the respect, though not always the agreement of his colleagues'. Platnauer was a more gentle person and is even described as 'cultured'. He was a mineralogist working in the British Museum before moving to York where his wife had an invalid father.

Together, Howarth and Platnauer produced the *Museums Directory* (1911) and although not the earliest survey it is still one of the most useful. This compendium was the result of partially fulfilling one of the aims of the Museums Association as suggested in 1889 at the first formal meeting — to produce an index of the general contents of museums. After nearly one hundred years the intermuseum cataloguing of collections at this level is close to being achieved. This has become possible through the development of regional Collection Research Units, groups of natural history curators voluntarily gathering and collating information. The first of these was in the north west though, rather than Yorkshire.

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YORKSHIRE NATURALISTS IN THE HISTORY OF ECOLOGY

P. D. LOWE

During the late Victorian and Edwardian period, the influence and fame of Yorkshire natural history spread far beyond the county. At the time, not only did the traditional pursuits of collecting and recording species flourish, but the county was also the setting for research and organizational developments of national and international significance. One of a number of new areas in which Yorkshire naturalists took the lead was ecology.

Though much isolated investigation had been conducted earlier, organized and systematic research in the discipline began in Britain with the establishment in 1902 of the Botanical Survey Committee of the Yorkshire Naturalists' Union. The prime mover was Dr William Smith, lecturer in botany at the Yorkshire College, Leeds. He and his younger brother, Robert, were the pioneers of ecological surveying in Britain. Both had studied botany at the University College, Dundee, under that extraordinary polymath, Patrick Geddes, who had impressed upon them his holistic vision of geographic regions. Robert, in addition, had spent a period with Charles Flahault of Montpellier, a leading French student of vegetation. The two brothers launched parallel vegetation surveys, involving the mapping of plant-associations and their life conditions. Robert's work on the vegetation of Scotland, however, was curtailed by his tragic death in 1900 at the age of twenty-six. William took over this project as well as his own survey of the vegetation of Yorkshire. He interested a number of up-and-coming Yorkshire botanists in the work, foremost among them being Charles Moss, a Bradford elementary teacher who was a leading member of the Halifax Scientific Society; Thomas Woodhead, lecturer in biology at Huddersfield Technical College; William Munn Rankin, a native of Skipton, who along with Woodhead and Moss had studied under Smith (before becoming a lecturer at Portsmouth Technical College); and William Crump, a Halifax science teacher who edited the *Halifax Naturalist.*

First fruits of this collaboration were published vegetation surveys — of the Leeds and Halifax district by Smith and Moss and of the Harrogate-Skipton area by Smith and Rankin — consisting of descriptive ecological accounts of the vegetation, accompanied by half-inch-to-the-mile maps showing the distribution of the principal types of vegetation in distinctive colours. These were the first vegetation maps to be published in England. Woodhead conducted a more detailed study of the plant associations in an area of woodland close to Huddersfield. His work on the ecology of woodland plants was the first intensive study of a plant community and its constituent species. The influence of the new outlook on W. B. Crump can be seen in the *Flora of Halifax*, which he produced jointly with Charles Crossland. Completed in 1904 and published in the *Halifax Naturalist*, it was the first local flora written from an ecological perspective, its outstanding features being a very careful analysis of the plant associations of the district and the special attention paid to the habitats of the species recorded.

Woodhead was a leading member of the Y.N.U. He was secretary of its Botanical Section, and from 1903, co-editor of the *Naturalist.* It may well have been he who induced Smith to convene a Botanical Survey Committee for the Y.N.U. The clear intention was to interest local naturalists throughout the county in vegetation survey work. Smith recognized the potential value of the assistance of the army of amateur naturalists within the Y.N.U., with their accumulated local knowledge. He drew up a scheme whereby local natural history societies might commence recording plant associations and this was printed in the *Naturalist* in 1903. Through the financial support of John Farrah, a wealthy Harrogate businessman who was President of the Union's Botanical Section, copies of Smith's scheme were sent to all the member societies of the Union. Smith, Woodhead and Moss followed up this advice with talks to local societies on the techniques, results and concepts of ecological work. They also regularly attended the Union's excursions, acting as advisers, demonstrating suitable methods of inquiry and discussing local problems in plant distribution. Accounts of the areas visited by the Union began to appear in ecological rather than floristic terms. Woodhead used his influence as editor of the *Naturalist* to promote ecological studies. This involved publishing not only the results of ecological research but also advice and encouragement on how to commence such research.

A steady stream of articles began to appear on Yorkshire ecology. An editorial of 1904 sought further to broaden the work:

> In view of the early completion of several monographs dealing with the Fauna and Flora of our area, we should welcome contributions tending to throw more light on problems of geographical distribution, especially with the object of providing materials for a zoological survey, on lines similar to those followed in the botanical survey.

This growing emphasis on ecological work did meet a degree of resistance, particularly from older men firmly in the systematic tradition. F. Arnold Lees, the Leeds doctor who had compiled the *Flora of West Yorkshire* was the most outspoken critic. Here is an extract from a letter that Herbert Corbett, a Doncaster surgeon and leading figure in the Y.N.U., wrote to Lees to rebuff some of his complaints:

> Now with regard to "the Naturalist". I do *not* agree with you that it has deteriorated. Careless proof reading I grant you, and I do not like the tone of some of the notes; but on the whole I think the matter is much *more scientific* and generally of interest than used to be the case. Formerly the magazine had become a medium for bits, endless lists, of plants, bugs, shells, and what not. Now these, though useful, are not wanted in a monthly magazine of natural history, or anyhow they should have a very secondary position in such a magazine. On the other hand I think that ecological papers such as we now get from Woodhead . . . are in advance of anything to be found in the old numbers. I am afraid that some of us "old fogeys" have rather a tendency to place too much importance on systematic work and species recording. Both still very useful and not yet complete. By all means let us keep on at the good work, but at the same time let us remember that cause and effect are of equal if not greater importance in the true study of Nature (Corbett, 6 September 1907).

The effect of the new ecological approach was, indeed, a great renaissance in Yorkshire botany. Previously there had been a feeling that the potential for further systematic work was practically exhausted. Now people with an intimate knowledge of the local flora turned to the study of plant communities. An interesting example was a collaboration between Charles Crossland and James Needham. These were two of the leading Yorkshire mycologists. They were not an untypical pair in the West Riding context: Needham was a Hebden Bridge foundry worker with little formal education who did a lot of the collecting for Crossland, a prosperous Halifax butcher. They applied their extensive knowledge to a study of the crucial role played by the cryptogams in the development of vegetation, in papers on the distribution and association of mosses and hepatics in the parish of Halifax (1903) and on the plants of Pecket Wood (1904).

These were part of a flood of ecological studies, some of a pioneering nature, others more derivative (Woodhead, 1923). A few of the more important, early contributions should be mentioned such as Samuel Margerison's study of ecological succession in the development of vegetation on quarry tips (1907–09). He carefully worked out the making of the soil, the pioneer vegetation, soil gatherers and binders, and the succession of associations leading to the closed association of a woodland flora. It was in studies of Pennine peat and the moorland plants growing on it that Yorkshire ecologists really made their mark. Moss (1902) was the first to point out the significance of the cotton-grasses in the vegetation of the moorlands. The Reverend T. A. Jeffries (1915) did important investigations of the role of Purple Heath Grass in moorland vegetation. W. B. Crump's work on the water content of peat and the wilting of moorland plants was a seminal contribution to the study of limiting environmental factors (1911). Somewhat later, Chris Cheetham and W. H. Burrell did an impressive study of the constituents of peat. One other pioneering research should briefly be mentioned. Frank Elgee's work on the moorlands of Cleveland was one of the first considerable attempts to correlate the fauna of an area with the vegetation (1912).

For a brief period, Yorkshire was the focus of ecological studies in Britain. Indeed, Yorkshire's naturalists were amongst the world leaders in this new field. However, its position

gradually declined as ecological work was taken up elsewhere and as some of the leading Yorkshire ecologists were offered posts outside the county.

The focus was broadened in December 1904 when the British Vegetation Committee was set up at a meeting, convened by W. G. Smith at his house in Leeds, which brought together people who were conducting ecological surveys in different parts of Britain (Lowe, 1976). It was intended to co-ordinate, on a national basis, the work of studying and mapping vegetation. Besides Smith, Moss, Woodhead, and Rankin, the initial membership included Francis Lewis, a Liverpool University botanist who had conducted a vegetational survey of the upper reaches of the rivers Eden, Tees, Wear, and Tyne; George Pethybridge and Robert Lloyd Praeger from Dublin who were doing work on the vegetation of the Wicklow Mountains; Marcel Hardy, another ex-student of Geddes, who was working in Scotland; and Arthur Tansley.

Tansley was the 'joker in the pack'. Trained at University College, London, and the Cambridge Botany School, and with a post as lecturer in botany at the former, he was more representative of mainstream academic biology than any of the others. He was not engaged in primary survey work, though he had led student field trips to Blakeney Point in Norfolk to study the vegetation of the shingle spit. He was attracted to ecology less as a field researcher and more as a philosophically-minded biologist who saw in this new discipline some challenging theoretical problems. Tansley was the vanguard of an influx of university biologists into ecology — mainly from Cambridge and London. Some, like Tansley, saw in ecology a novel field for testing modern biological theories. Most saw in it an opportunity to take their laboratory researches and experimental techniques out of doors. To them, ecology was whole plant physiology *in vitro*.

Tansley proposed a division of labour between amateurs and professionals within ecology. On the one hand, there was the mainly descriptive work of primary survey. 'The plant associations which are the object of our study must be first characterized, enumerated, and described' (1904). Tansley (1902) suggested that such 'Ecological surveying is comparatively easy and very attractive work . . . a knowledge of the rudiments of geology, a fair acquaintance with the species composing the flora, and quick eyes, form the most necessary equipment for the pursuit'. Good maps and a camera though very desirable adjuncts were not essential. Tansley considered that such work was suitable for amateur naturalists and their local societies, under proper guidance and control. On the other hand, there was the need to determine why the plants which lived together under definite environmental conditions came to be thus associated — how they came to be, and maintain themselves, where they were, how they came to exhibit the morphological and physiological features they did, and what were their detailed functional relations to one another and their inorganic surroundings:

> These indeed are topics on which our knowledge is of the most fragmentary description, about which we have still practically everything to learn. It is a much more difficult, as it is undoubtedly a much higher task than the descriptive one. It involves careful and patient observation and experiment, and the application and adaptation of the methods of ordinary physiology to the solution of these special problems.

The implication was that this more analytical work was only suited to trained specialists with access to a laboratory.

In differentiating the scientific tasks of the amateur and the professional, and denoting their contributions qualitatively unequal, the division of labour suggested by Tansley augured the gradual exclusion of the amateur naturalist from ecology. The central tasks required specialist training. As with other specialisms, ecology soon became concerned with the training of its own recruits in schools and universities (Duff & Lowe, 1981). Experimental technique and theory also developed quickly. Thomas Woodhead was led to complain 'ecology has often drifted into unintelligible channels and thus alienated the sympathies of many who are otherwise attracted by the ecological outlook' (1929). As university plant physiologists came to dominate ecology, the broad, pioneering geographical approach in which amateur naturalists had excelled became eclipsed.

The formation of the British Ecological Society in 1913 illustrates the impact of these developments on the following for ecology. The Society was the successor to the British

Vegetation Committee. Of the 112 initial members, only 7 per cent were located in Yorkshire, compared with 26 per cent in London. Some 70 per cent of them had a university degree, the majority from London or Cambridge (17 per cent held doctoral degrees). Just over half were academics. The rest included civil scientists, museum curators and biology teachers. Only 18 per cent were amateurs.

The very low involvement of Yorkshire naturalists in the British Ecological Society did not mean the demise of Yorkshire ecology. Far from it. It was in such a healthy and vibrant state that few felt the need to belong to the national society. An interesting sidelight on this is given in two letters to Woodhead from Frank Cavers, the first editor of the British Ecological Society's *Journal of Ecology*:

> in turning over the last few years *Naturalists*, I feel very envious of some of your things . . . and wish that in the future you will send me some of these instead of putting them in the *Naturalist*! I suppose you haven't got such an article handy just now, or could do so in the near future (17 February 1913).

and then six months later:

> I hope you will bring back from the far North material for an article in the Journal of Ecology soon. It is an awful business getting articles at present (31 August 1913).

I doubt if the present editor of the *Naturalist* often finds the editor of the *Journal of Ecology* begging him for rejected articles.

Though Yorkshire ecology was very much alive, it was (with one or two notable exceptions) set on a different route from academic ecology. It was more descriptive, observational and geographical in its orientation in contrast to the latter's more analytical, experimental and physiological approach. For good or ill, academic ecology became the mainstream.

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GALL MIDGE ON *HYPOXYLON*

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At the spring foray of the Yorkshire Naturalists at Pickering, April 1980, a collection of a pyrenomycete resembling a species of *Lophium* was made. The structures were accompanied by extensive development of a species of *Nodulisporium* which superficially resembled a resupinate basidiomycete.

When the blister-like swellings were squashed for microscopic examination little fungal material was found but instead orange-yellow oily material of animal origin was released. By more careful opening each swelling contained either a grub or a pupa. Unfortunately even with the help of many entomologists I was unable to decide what the insect was, other than probably a Cecidomyiidae (Gall-midge).

One year later whilst collecting at the Den of Airlie, Angus, for my continuing study of British members of the Xylariaceae I again found the striking galls. As before the blisters were found free of, or almost embedded in, the same *Nodulisporium*. On this occasion however, they did not cover a branch *(Acer)* as broad as a man's arm but a fallen main branch *(Fagus)* over 1 metre in length and a score of centimetres in diameter. The surface was covered in hundreds of blisters many so close to each other as to give the appearance of small patches of black bivalve shells, some with their valves gaping. On closer examination the galls were associated with old stromata of the pyrenomycete *Hypoxylon rubiginosum* (Pers. ex Fries) Fries (Ascomycotina) and even this was intermixed with extensive developments of *Diatrype stigma* (Hoffmann ex Fries) Fries and *Melanomma pulvis-pyrius* (Pers. ex Fries) Fuckel. In September of the same year the locality was again visited and more galls were found; this time part of the branch was brought back in the hope of rearing adults. Some of the blisters had lost their tops and remained as black cup-shaped structures; no adult midges were found. Apparently the adults push through a crack they make at the periphery of the blister.

Hincks (1958) described similar structures on an unidentified fungus, thought to be a sterile species of *Tomentella* (resupinate basidiomycete) although no spores were present. His material in the Manchester Museum is similar in all respects to the Pickering and Angus material but the substrate is not a basidiomycete but an effete *Nodulisporium*, very possibly the conidial state of *Hypoxylon rubiginosum*. The midge was identified as *Mycocecis ovalis* Edwards originally described (1922) from a basidiomycete: *Hypochnus fuscus* ie, *Tomentella fusca* (Pers.) Schroet. Unfortunately no fungus has been retained with Edwards' type specimen. However, in the collections at the British Museum in addition to the type there is a second collection of this interesting gall midge. The host was this time present, and had again been identified as *Hypoxylon rubiginosum* (IMI 124779); the collection was made by R. Evans.

Evans (1970; 1979) has found the gall midge several times in the Midlands and apparently always on *H. rubiginosum*; some of his material has been deposited with accompanying correspondence at Kew. He draws attention to a single collection where blisters were found near to *H. multiforme*. In addition, it is of interest to note that with Harris (1979) he has described a second gall midge, the host of which is *Peniophora cinerea* (Fries) Cooke, ie a member of the Basidiomycotina.

Part of the Angus collection (Wat. 14005; 14350) has been deposited at the Manchester Museum and the Royal Scottish Museum, Edinburgh; the Yorkshire material is in E as Wat. 14349.

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BOOK REVIEWS

The Biology of Centipedes by **J. G. E. Lewis**. Pp. 476, including 220 text figures. Cambridge University Press. 1981. £33.

This is a book to consult rather than to read. Apart from the only really detailed account I know of the effect of centipede bites (which the author makes clear are exaggerated) it has little to offer the general reader, but it is a mine of information for the specialist. Most of the book is made up of an exhaustive (and exhausting) review of the literature on the functional anatomy of centipedes, with relatively little emphasis on behaviour, physiology and ecology. This lack of balance is probably inevitable, given the bias of the literature towards morphology. I would have liked some details on the Myriapod Survey Scheme in the UK as an example of current attempts to study geographical distribution and habitat preference. The treatment is worldwide and the author has spared no effort in his remorseless search of the literature. Monumental, and somewhat indigestible.

SLS

The Oxford Companion to Animal Behaviour, edited by **D. McFarland**. Pp. 657. Oxford University Press. 1981. £17.50.

Animal behaviour is a relatively new science, which has witnessed a considerable expansion in the past two decades largely in response to the stimulus of such pioneers as Konrad Lorenz and Nikko Tinbergen. It has now reached the stage of requiring a compendium to explain and elaborate to the reader the use and context of behavioural terms. The book is a mine of information with all its inclusions placed, as far as possible, in the context of relevance to the ethologist. The coverage ranges from more technical aspects, e.g. appetitive behaviour, consummatory behaviour, intention movements and sign stimulus, to others less so, e.g. field studies, predation and welfare of animals. The alphabetical presentation of the accounts provides ease of access; furthermore each item is presented with clarity and in a sufficiently comprehensive form to be of use to the more serious student.

Overlaps with other disciplines do occur and there are times when entries would probably be more appropriate in companion volumes. For example, colour vision, menstrual cycle (why is oestrus dealt with in such a perfunctory manner when it is a much more widespread phenomenon?), and flight have their emphases in physiology and wildlife management in ecology

This is a useful, readable and substantial book of considerable value to both specialist and non-specialist reader seeking background information on behavioural phenomena. The account is well supported by numerous informative, well-executed line drawings.

MJD

Molluscs and Man by **P. R. Boyle**. Pp. 60. Edward Arnold. 1981. £2.25 paperback.

This constitutes the 134th booklet in the Institute of Biology's Studies in Biology, a series developed to enable teachers and students to learn about significant developments within the field covered by the subject. The limited space available in this type of publication necessitates a simple if not simplistic look at the Mollusca and their importance to man. The large number of facts and figures quoted do make very interesting reading, however, particularly with respect to world fisheries. It constitutes an interesting addition to the series, and one that probably deserves success.

AN

THE PHYTOPHAGOUS INSECT FAUNA OF *MERCURIALIS PERENNIS* L.

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Introduction

Published records of phytophagous insects and their hosts in the British flora, which are necessary for an understanding of the structure and functioning of phytophagous insect communities, are incomplete.

Much information, however, can be derived from accounts of the biology and ecology of those plant species covered in the Biological Flora of the British Isles series published in the *Journal of Ecology*, and from the ecological and entomological literature (see references). However, data derived from these sources must be treated with caution, as pointed out by Lawton and Schroder (1978), due to the loose use of the word 'associated' which may encompass casual visitors such as nectar feeders and predatory species, as well as the species which actually feed on the particular host plant.

The lack of data on the phytophagous insects exploiting *Mercurialis perennis* L. (nomenclature of vascular plants follows Clapham *et al.*, 1962), a perennial, dioecious rhizomatous herb of woodlands and other shady habitats (Mukerji, 1936), encouraged further work on the subject. Data were derived from field sampling from three sites and from a literature search for records of associated insect species. Four categories of association with the host plant have been used in this paper and they are as follows:

(a) Leaf/stem feeders include sap-sucking Hemiptera, chewing Lepidoptera and Coleoptera and stem miners (usually Coleoptera larvae).

(b) Species associated with decaying plant material in general, which feed on fungal hyphae (utilizing senescing leaves as a substrate) and other organic debris such as pollen and spores.

(c) Species in the uncertain category include those which are known to be polyphagous and which might plausibly be feeding on *M. perennis*. However, there is no direct evidence for a feeding association.

(d) Stray/casual species are those found on the plant but are not feeding (as far as is known). This category also includes casual flower feeders which exploit part of the plant by feeding on nectar or pollen but are not closely associated with it.

The factors determining the total number of phytophagous insect species to which a particular plant species is host include its geographical range, growth form and the taxonomic isolation of the host plant as well as community parameters such as its associated plant species and the physical nature of its habitat. These and other factors have been examined by numerous authors, but useful reviews are those of Lawton (1978), May (1979) and Strong and Levin (1979).

Seasonal changes in insect species richness and diversity on one species of host plant have also received some attention. A number of hypotheses have been advanced to explain such changes including seasonal variation in the composition and levels of secondary plant compounds and similarly variation in the levels of various nutrients in plants which have been correlated with changes in the insect community (Feeny, 1970, 1976; Southwood, 1973; Lawton, 1976; McNeill & Southwood, 1978; Hodkinson *et al.*, 1979; Chapin *et al.*, 1980). However, Lawton (1978) favoured seasonal changes in plant architectural complexity as an explanation for the changes in insect species richness and diversity, following a reassessment of his bracken fern data (Lawton, 1976).

Samples Sites And Methods

M. perennis was sampled at three sites in County Durham: *Site 1*: (Little High Wood, Grid Ref. NZ 268403, 8.5 km from site 3, and 9 km from site 2) is open, broad-leaved woodland, chiefly of *Acer pseudoplatanus*. *M. perennis* here grows in pure and mixed stands on a gentle sloping bank. Common associates include *Geum urbanum*, *Hedera helix*, *Ranunculus ficaria*, *Stachys sylvatica*,

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Urtica dioica and an extensive ground carpet of the moss *Thuidium tamariscinum* (nomenclature of mosses follows Smith, 1978).

Site 2: (Elemore Hall, Grid Ref. NZ 352445, 5 km from site 3) is open, broad-leaved woodland composed mainly of *Acer pseudoplatanus* and *Tilia platyphyllos*. The species grows in pure and mixed stands and associates include *Epilobium angustifolium, Geranium robertianum, Geum urbanum, R. ficaria, Rubus fruticosus* agg., *Silene dioica, Stachys sylvatica* and *Urtica dioica*.

Site 3: (Shadford Dene, Grid Ref. NZ 351398) is relatively open scrub interspersed with small areas of rough grassland. *M. perennis* grows in circular stands at the base of shrub species such as *Ulex europaeus, Crataegus monogyna* and *Prunus spinosa*.

Adjacent and surrounding areas are chiefly species rich Magnesian limestone grassland.

At each site, cut samples of complete *M. perennis* stems were taken during daylight hours at the beginning of each month from May to July 1980. In each case 100 one-stem samples were removed by carefully cutting off individual shoots at ground level without jarring the plant and then rapidly placing each sample in a separate large polythene bag. No attempt was made to sample the roots, rhizomes or leaf litter underneath the herb canopy.

At sites 1 and 2, shoots were selected at random along a zig-zag transect line to avoid retracing areas and hence avoiding undue disturbance. At site 3, ten shrub 'islands' with surrounding stands of *M. perennis* were selected and ten samples were taken from each in the manner described above. After each sampling, a random search (*c*. 20 min.) for additional insect species was carried out. This latter method did not reveal any additional phytophagous species.

It is possible that some species were overlooked by the sampling procedure throughout the three-month period for behavioural reasons. For example, *Barynotus moerens* (insect nomenclature follows Kloet & Hincks, 1964, 1972 & 1977) (Coleoptera: Curculionidae) is usually a nocturnal feeder and during the day can be found on the ground under the host plant (Read, 1978; M. G. Morris, *pers. comm.*).

Each sample was emptied and shaken over a white enamel tray and the whole plant sample was carefully searched. In addition, the stem of every fifth sample was dissected to check for stem miners. All phytophagous insect species were collected, recorded and identified. Details of stem height, leaf number and the length and breadth of three randomly selected leaves (one of opposite, equal pairs) excluding the top pair were recorded. These few parameters provide a crude index of the available plant resource but take no account of foliage quality/palatability. Measurements were taken to see if any relationship existed between insect species richness and above ground plant biomass over the sampling period. The product of the maximum leaf length × the maximum leaf width was used as an estimate of leaf area, since a linear relationship exists between this figure and actual leaf area (Wilson, 1968; Wade, 1978).

Lepidoptera larvae and pupae were reared through to adults (unless parasitized) to facilitate identification. A feeding experiment was conducted with the weevil *Barypeithes pellucidus* (Coleoptera: Curculionidae) as its association with *M. perennis* was uncertain. Four individuals were kept in petri dishes with fresh, undamaged leaves of the plant. After three days no feeding holes were observed. Two individuals were transferred to a petri dish containing partially senescent and senescent leaves and feeding holes were subsequently observed in these leaves. The two individuals remaining with fresh leaves died.

A number of stems known to contain stem mining larvae were kept in a container inserted vertically into a base of moist filter paper. After a period of three weeks adult specimens of the weevil *Apion pallipes* emerged.

Source material consulted for records of species feeding on *M. perennis* are listed in the references.

Results

Mean and standard errors were calculated for stem height, leaf number and leaf area data, for each monthly sampling. The latter data from the three sites were combined for each month giving larger sample sizes. In addition, mean leaf area per plant was also calculated (mean leaf number per plant × mean leaf area).

Table 1 shows the change in mean stem height (cm), mean leaf number, mean leaf area (cm^2) and mean leaf area per plant for *M. perennis* over the sampling period.

TABLE 1

Monthly mean values of plant architecture parameters to show changes in the resources available to phytophagous insects

	Mean Stem Height (cm) with Standard Error and Sample Size (n)	Mean Leaf Number with Standard Error and Sample Size (n)	Mean Leaf Area (cm^2) with Standard Error and Sample Size (n)	Mean Leaf Area per Plant (cm^2) with Standard Error and Pooled Sample Size (n)
May	28.2 ± 0.7 n = 74	13.5 ± 0.2 n = 74	13.93 ± 0.56 n = 220	188.6 ± 1.02 n = 294
June	36.1 ± 0.8 n = 80	13.8 ± 0.2 n = 80	21.29 ± 0.57 n = 235	294.9 ± 1.03 n = 315
July	39.8 ± 0.9 n = 62	13.7 ± 0.3 n = 62	24.7 ± 0.67 n = 191	338.6 ± 1.34 n = 253

TABLE 2

Phytophagous insect species recorded as being associated with *M. perennis* in the British Isles

Order and Species	Main Sources	Association with Host Plant
COLEOPTERA		
Apion pallipes Kirb.	Fowler (1891), Joy (1932), Walsh (1954), Linssen (1959), Walsh & Dibb (1975), L. K. Ward (*pers. comm.*)	Leaf feeder
Barynotus moerens F.	Joy (1932), Walsh (1954), Linssen (1959), Walsh & Dibb (1975)	Leaf feeder
Hermaeophaga mercurialis F.	Fowler (1891), Joy (1932), Walsh (1954), Linssen (1959), Welch (1972), Walsh & Dibb (1975), L. K. Ward (*pers. comm.*)	Monophagous. Adult-leaf feeder, Larva-Root feeder
Meligethes kunzei Er.	Fowler (1891), Walsh (1954), Walsh & Dibb (1975)	Flower feeder — polyphagous
Tropiphorus elevatus Hbst.	Joy (1932), Linssen (1959), L. K. Ward (*pers. comm.*)	Leaf feeder
Tropiphorus obtusus Bons.	Joy (1932), Linssen (1959)	Leaf feeder
Tropiphorus terricola Newn.	Fowler (1891), July (1932), Walsh (1954), Linssen (1959), Walsh & Dibb (1975)	Leaf feeder
HEMIPTERA: HETEROPTERA		
Calocoris major Schol.	Butler (1923)	Collected from *M. perennis* (see text)
Calocoris sexguttatus F.	Butler (1923)	Collected from *M. perennis* (see text)
Dicyphus stachydis Reut.	Butler (1923)	Collected from *M. perennis* (see text)
Psallus variabilis Fall.	Butler (1923)	Collected from *M. perennis* (see text)

(Continued overleaf)

Table 2 (continued)

Psallus varians Herr.	Butler (1923)	Collected from *M. perennis* (see text)
HEMIPTERA: HOMOPTERA		
Aulacorthrum solani Kltb.	L. K. Ward (*pers. comm.*)	Extremely polyphagous — Leaf/stem feeder
Cixius distinguendus Kirsch.	Whittaker (1969)	Leaf feeder. Polyphagous?
LEPIDOPTERA		
Micropterix calthella L.	J. Flint (*pers. comm.*)	Polyphagous pollen (flower) feeder
Olindia schumacherana F.	Ford (1949), Bradley *et al.* (1973)	Polyphagous — Leaf feeder
Phlogophora meticulosa L.	L. K. Ward (*pers. comm.*)	Extremely polyphagous — Leaf feeder
Pyrausta nivealis F.	Ford (1949)	Polyphagous — Leaf feeder
Pyrausta olivalis Schiff.	Ford (1949), Beirne (1952)	Polyphagous — Leaf feeder
THYSANOPTERA		
Thrips fulvipes Bagn.	Morison (1949), Mound (1967), Mound *et al* (1976), Pitkin (1976), L. K. Ward (*pers. comm.*)	Larva monophagous Adult: foliage and flower feeder; but will visit flowers of other plant species

Table 2 lists all the phytophagous insect species recorded as being associated with *M. perennis* in Britain, derived mainly from a literature search. The type of association of the species with the host plant is indicated where such knowledge is available. The Hemiptera-Heteroptera records from Butler (1923) are not feeding records *per se*, but represent occasions where field entomologists have collected individuals from *M. perennis*. *Psallus variabilis, P varians* and *Dicyphus stachydis* (Heteroptera: Miridae) are all almost certainly casuals (Southwood & Leston, 1959).

The phytophagous insect species derived from the monthly samplings at the three sites are listed in Table 3. Data from the three samplings at the three sites have been combined for convenience. The full data, including the temporal distribution of insect species and the numbers of individuals collected at each of the three sites on three separate occasions, are given in Jefferson (1980).

Each species in Table 3 has been allotted a category according to its association with the host plant (see Introduction). Inevitably, some uncertainty exists with regard to the exact association of some species with *M. perennis* and hence some of the assumptions may turn out to be incorrect. A small number of unidentified immature species of the families Cicadellidae (Hemiptera: Homoptera) and Miridae have been omitted from Table 3 because they are almost certainly casuals.

Fig 1 shows the change in the number of associated insect species over the sampling period (see Figure legend for further explanation). The data from all sites were combined for each month. Four assumptions have been made in the production of Fig 1. Firstly, it is assumed that *Calocoris major* and *C. sexguttatus* (Heteroptera: Miridae) both feed on *M. perennis*. Adults and nymphs of these two species were found on the plant at sites 1 and 2 throughout the sampling period and although no direct evidence is available, a feeding association seems likely. *Urtica dioica* is listed as the food plant for these two species in the literature (Saunders, 1982; Butler,

1923; Southwood & Scudder, 1956; Southwood & Leston, 1959). Secondly, *B. pellucidus* (Coleoptera: Curculionidae) is included in category (a) even though it feeds on the senescing leaves of the plant. Thirdly, the three different Leipidoptera pupae (unidentified species A, B and E — see Table 2) found attached to the leaves of *M. perennis* are assumed to have fed on the plant when they were larvae. Finally, it was not possible to identify all the Thysanoptera individuals in the time available and hence unidentified individuals (nymphs and adults) taken on the plant in June and July are assumed to be *Thrips fulvipes* (Thysanoptera: Thripidae). This is not unreasonable as this species breeds only on *M. perennis* and therefore the nymphs were probably *T. fulvipes*, although the possibility that the polyphagous species *T. atratus* might have been represented cannot be ruled out. Adults may have been individuals of the two aforementioned species as well as other species not associated with the plant in a breeding sense.

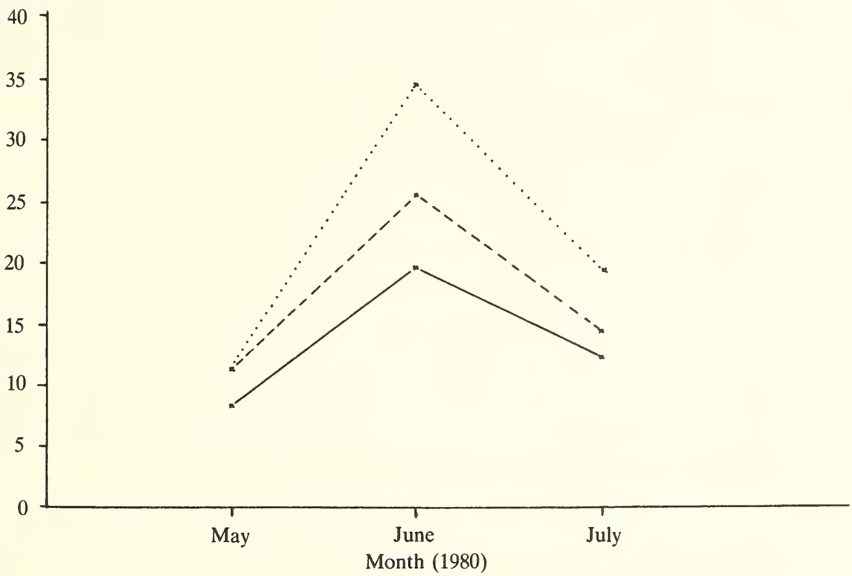

FIGURE 1

Changes in the numbers of insect species found on *M. perennis* from May to July at three sites in County Durham.
——— leaf/stem feeders only, – – – leaf/stem feeders plus species of uncertain status, ···· leaf/stem feeders plus uncertain species plus species associated with decaying plant material. For details of full category definitions see text.

Discussion

M. perennis occurs in 72 per cent of the 10-km grid squares covering England, Wales and Scotland (Perring & Walters, 1976). The relationship between the geographical range of a plant species and the number of associated phytophagous insect species has been expressed graphically for the four groups of plant life-forms including perennial herbs, by Lawton & Schroder (1977) using Biological Flora data. Using their species-area graph for perennial herbs, a figure of 22 species can be derived for *M. perennis*. The figure of 22 species is the 'expected' number of species feeding on the plant in Britain. Firstly it must be stressed that this figure is an

TABLE 3

Insect species collected from *M. perennis*. Combined results of three samplings (May, June, July, 1980) at three sites (No's 1–3) in County Durham. Adults were taken unless indicated by L (= Larvae), P (= Pupae) (Endoterygota) or N (= Nymph) (Exopterygota)

Order and Species	No of Site at which taken	Nature of Association with Plant (see text)	Notes
COLEOPTERA			
Apion pallipes Kirb. (adults)	1, 2	Leaf/stem feeder	Also recorded on *Allium ursinum*
Apion pallipes Kirb. (larvae)	1	Leaf/stem feeder	Mine stems of *M. perennis*
Atomaria atricapilla Steph.	1	Associated with decaying plant material	
A. berolinensis Kr.	1, 2	Associated with decaying plant material	
A. fuscata Schor.	1	Associated with decaying plant material	
A. fuscicollis Man.	1	Associated with decaying plant material	Most species of this genus are to be found in rotting vegetation and organic waste in general, where they feed on fungal hyphae
A. nigriventris Steph.	2	Associated with decaying plant material	
A. pusilla Pk.	1	Associated with decaying plant material	
A. ruficornis Marsh	1	Associated with decaying plant material	
Barynotus moerens F.	1, 2, 3,	Leaf/stem feeder	Adult — also feeds on *Ranunculus repens*? Larvae — feed on roots of *M. perennis*
Barypeithes pellucidus Bohn.	1	Leaf/stem feeder (see text)	
Batophila rubi Pk.	3	Stray/casual	Chiefly on *Rubus* sp.
Chaetocnema concinna Marsh.	1	Stray-casual	
Chrysolina polita L.	2	Uncertain	Oligophagous — usually feeds on the Labiatae family
Corticaria crenulata Gyll.	1	Associated with decaying plant material	
C. elongata Gyll.	1	Associated with decaying plant material	
Crepidodera transversa Marsh.	3	Uncertain	Food plants probably include *Urtica dioica* and species of *Cirsium*
Enicmus histrio Joy.	1	Associated with decaying plant material	
Lathridius nodifer Westw.	1	Associated with decaying plant material	
Liosoma deflexum Panz.	1	Stray/casual	Feeds on species of Ranunculaceae
Longitarsus sp.	3	Stray/casual	
Meligethes sp.	3	Stray/casual	Species of this genus occur on the flowers of many plant species and few are host specific
Micrurula melanocephala Marsh.	2	Stray/casual	Found in the flowers of many species
Phyllobius calcaratus F.	1, 2, 3	Uncertain	Polyphagous
P. pyri L.	3	Uncertain	Polyphagous
P. viridiaeris Laich.	2	Uncertain	Polyphagous
Rhinosimus viridipennis Lat.	2	Associated with decaying plant material	
Rhynchaenus fagi L.	1, 2	Stray-casual	Larvae and adults feed on *Fagus sylvatica*
Sciaphilus asperatus Bons.	1, 2	Uncertain	Polyphagous
COLLEMBOLA			
Bourletiella bicincta Koch.	1	Leaf/stem feeder	
B. flava Gisin.	1, 2	Leaf/stem feeder	
B. pallipes Bour.	2	Leaf/stem feeder	Many species of this genus feed extensively on the foliage of Spermatophytes as well as on pollen and fungal spores
B. repanda Agr.	1, 2, 3	Leaf/stem feeder	
B. sulphuren Koch.	unknown	Leaf/stem feeder	

Entomobrya nivalis Linné	1, 2, 3	Associated with decaying plant material	Probably feed on leaf surface microflora, fungal hyphae, pollen and spores
Lepidocyrtus lignorum F.	1, 2, 3	Associated with decaying plant material	
Orchesella cincta L.	2	Associated with decaying plant material	
HEMIPTERA: HETEROPTERA			
Calocoris major Schol.	1(+N) 2(+N)	Leaf/stem feeder	Probably polyphagous (see text)
C. quadripunctatus Vill.	1	Stray/Casual	On *Quercus* sp., partly predatory
C. sexguttatus F.	1(+N) 2(+N) 3(+N)	Leaf/stem feeder	Probably polyphagous — also partly predatory
Dicyphus stachydis Reut.	1, 2	Stray/casual	Feeds on *Stachys sylvatica*
Dryophilocoris flavoquadrimaculatus DGr.	3	Stray/casual	On *Quercus* sp., partly predatory
Elasmostethus interstinctus L.	1, 2	Stray/casual	Polphagous but prefers *Betula* sp.
Harpocera thoracica Fall.	2	Stray/casual	On *Quercus* sp.
Leptopterna dolabrata L.	3(+N)	Stray/casual	Polyphagous on various *Graminae.*
Plesiocoris rugicollis Fall.	1(+N)2	Uncertain	Polyphagous
HEMIPTERA: HOMOPTERA			
Aphrophora alni Fall.	2, 3	Stray-casual	Polyphagous
Drepanosiphum sp.	1, 2	Stray/casual	Species feed on *Acer campestre* & *A. pseudoplatanus*
Philaenus spumarius L.	2(+N) 3(+N)	Leaf/stem feeder	Widely polyphagous
Psylla peregrina Fors.	3(+N)	Stray/casual	Host plants are *Crataegus monogyna* & *C. oxycanthoides*
Uroleucon sp.	3(N)	Stray/casual	Species of this genus are mono- or oligophagous on various Compositae
LEPIDOPTERA			
Olindia schumacherana F.	1(L)	Leaf/stem feeder	Polyphagous
Perizoma didymata L.	1(L) 2(L) 3(L)	Leaf/stem feeder	Polyphagous
Phlogophora meticulosa L.	1(L)	Leaf/stem feeder	Widely polyphagous
Pyrausta olivalis Schiff.	2(L)	Leaf/stem feeder	Polyphagous
Unidentified species (A)	1(P)	Leaf/stem feeder?	
Unidentified species (B)	1(P)	Leaf/stem feeder?	
Unidentified species (C)	1(L) 2(L) 3(L)	Leaf/stem feeder	
Unidentified species (D)	2(L)	Leaf/stem feeder	
Unidentified species (E)	2(P)	Leaf/stem feeder?	
PSOCOPTERA			
Unidentified species	1(N)	Associated with decaying plant material	Feed on many types of organic debris
THYSANOPTERA			
Limothrips cerealium Hall.	3	Stray/casual	Associated with various Graminae
L. denticornis Hall.	3	Stray/casual	In the florets of various Graminae
Taenothrips inconsequens Uzel.	1	Stray/Casual	Host plants include *Pyrus* sp., *Malus* sp. & *Acer* sp.
Thrips atratus Hall.	1, 2, 3	Uncertain	Polyphagous — breeds on a number of hosts
Thrips fulvipes Bagn.	1(+N) 2(+N) 3(+N)	Leaf/stem feeder	Host plant is *M. perennis*

TABLE 3

Insect species collected from *M. perennis*. Combined results of three samplings (May, June, July, 1980) at three sites (No's 1–3) in County Durham. Adults were taken unless indicated by L (= Larvae), P (= Pupae) (Endoterygota) or N (= Nymph) (Exopterygota)

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Apion pallipes Kirb (larvae)	1	Leaf/stem feeder	Mine stems of *M perennis*
Atomaria atricapilla Steph.	1	Associated with decaying plant material	
A berolinensis Kr.	1, 2	Associated with decaying plant material	
A. fuscata Schor.	1	Associated with decaying plant material	
A fuscicollis Man.	1	Associated with decaying plant material	Most species of this genus are to be found in rotting vegetation and organic waste in general, where they feed on fungal hyphae
A. nigriventris Steph.	2	Associated with decaying plant material	
A. pusilla Pk	1	Associated with decaying plant material	
A ruficornis Marsh	1	Associated with decaying plant material	
Barynotus moerens F	1, 2, 3,	Leaf/stem feeder	Adult — also feeds on *Ranunculus repens*? Larvae — feed on roots of *M. perennis*
Barypeithes pellucidus Bohn.	1	Leaf/stem feeder (see text)	
Batophila rubi Pk	3	Stray/casual	Chiefly on *Rubus* sp
Chaetocnema concinna Marsh.	1	Stray-casual	
Chrysolina polita L.	2	Uncertain	Oligophagous — usually feeds on the Labiatae family
Corticaria crenulata Gyll.	1	Associated with decaying plant material	
C. elongata Gyll.	1	Associated with decaying plant material	
Crepidodera transversa Marsh	3	Uncertain	Food plants probably include *Urtica dioica* and species of *Cirsium*
Enicmus histrio Joy.	1	Associated with decaying plant material	
Lathridius nodifer Westw.	1	Associated with decaying plant material	
Liosoma deflexum Panz.	1	Stray/casual	Feeds on species of Ranunculaceae
Longitarsus sp.	3	Stray/casual	
Meligethes sp.	3	Stray/casual	Species of this genus occur on the flowers of many plant species and few are host specific
Micrurula melanocephala Marsh.	2	Stray/casual	Found in the flowers of many species
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P pyri L.	3	Uncertain	Polyphagous
P. viridiaeris Laich.	2	Uncertain	Polyphagous
Rhinosimus viridipennis Lat.	2	Associated with decaying plant material	
Rhynchaenus fagi L.	1, 2	Stray-casual	Larvae and adults feed on *Fagus sylvatica*
Sciaphilus asperatus Bons.	1, 2	Uncertain	Polyphagous
COLLEMBOLA			
Bourletiella bicincta Koch.	1	Leaf/stem feeder	
B. flava Gisin.	1, 2	Leaf/stem feeder	
B. pallipes Bour.	2	Leaf/stem feeder	Many species of this genus feed extensively on the foliage of Spermatophytes as well as on pollen and fungal spores
B repanda Agr	1, 2, 3	Leaf/stem feeder	
B sulphuren Koch	unknown	Leaf/stem feeder	
Entomobrya nivalis Linné	1, 2, 3	Associated with decaying plant material	
Lepidocyrtus lignorum F	1, 2, 3	Associated with decaying plant material	Probably feed on leaf surface microflora, fungal hyphae, pollen and spores
Orchesella cincta L.	2	Associated with decaying plant material	
HEMIPTERA. HETEROPTERA			
Calocoris major Schol.	1(+N) 2(+N)	Leaf/stem feeder	Probably polyphagous (see text)
C. quadripunctatus Vill	1	Stray/Casual	On *Quercus* sp., partly predatory
C. sexguttatus F	1(+N) 2(+N) 3(+N)	Leaf/stem feeder	Probably polyphagous — also partly predatory
Dicyphus stachydis Reut.	1, 2	Stray/casual	Feeds on *Stachys sylvatica*
Dryophilocoris flavoquadrimaculatus DGr.	3	Stray/casual	On *Quercus* sp , partly predatory
Elasmostethus interstinctus L.	1, 2	Stray/casual	Polphagous but prefers *Betula* sp.
Harpocera thoracica Fall.	2	Stray/casual	On *Quercus* sp.
Leptopterna dolabrata L.	3(+N)	Stray/casual	Polyphagous on various *Graminae*.
Plesiocoris rugicollis Fall.	1(+N)2	Uncertain	Polyphagous
HEMIPTERA HOMOPTERA			
Aphrophora alni Fall.	2, 3	Stray-casual	Polyphagous
Drepanosiphum sp.	1, 2	Stray/casual	Species feed on *Acer campestre* & *A. pseudoplatanus*
Philaenus spumarius L.	2(+N) 3(+N)	Leaf/stem feeder	Widely polyphagous
Psylla peregrina Fors.	3(+N)	Stray/casual	Host plants are *Crataegus monogyna* & *C. oxycanthoides*
Uroleucon sp.	3(N)	Stray/casual	Species of this genus are mono- or oligophagous on various Compositae
LEPIDOPTERA			
Olindia schumacherana F.	1(L)	Leaf/stem feeder	Polyphagous
Perizoma didymata L.	1(L) 2(L) 3(L)	Leaf/stem feeder	Polyphagous
Phlogophora meticulosa L.	1(L)	Leaf/stem feeder	Widely polyphagous
Pyrausta olivalis Schiff.	2(L)	Leaf/stem feeder	Polyphagous
Unidentified species (A)	1(P)	Leaf/stem feeder?	
Unidentified species (B)	1(P)	Leaf/stem feeder?	
Unidentified species (C)	1(L) 2(L) 3(L)	Leaf/stem feeder	
Unidentified species (D)	2(L)	Leaf/stem feeder	
Unidentified species (E)	2(P)	Leaf/stem feeder?	
PSOCOPTERA			
Unidentified species	1(N)	Associated with decaying plant material	Feed on many types of organic debris
THYSANOPTERA			
Limothrips cerealium Hall.	3	Stray/casual	Associated with various Graminae
L. denticornis Hall.	3	Stray/casual	In the florets of various Graminae
Taenothrips inconsequens Uzel.	1	Stray/Casual	Host plants include *Pyrus* sp., *Malus* sp. & *Acer* sp.
Thrips atratus Hall.	1, 2, 3	Uncertain	Polyphagous — breeds on a number of hosts
Thrips fulvipes Bagn.	1(+N) 2(+N) 3(+N)	Leaf/stem feeder	Host plant is *M. perennis*

approximation as the Biological Flora data are often incomplete and unreliable and seldom include species belonging to small orders such as Collembola and Thysanoptera. Examples include members of the family Sminthuridae (Collembola), the globular Springtails where detailed sampling and examination of plants are required to find these insects and hence they may be under-recorded on Spermatophytes. Secondly, the species-area relationship is only a general trend and some plant species have less or more parasite species than would be predicted. Finally, the presence or absence of a plant species in 10-km grid squares gives only a very crude idea of its real abundance.

Sampling revealed a total of 21 species on *M. perennis* (i.e. those species included in category (a) — see above) and a literature search revealed 13 species giving a net total of 28. This figure is greater than the estimate cited above and tends to contradict views exeven though it contains the alkaloid Mercurialine and a number of other secondary compounds including Kampferol, Kampferol di-glucoside, Quercetin and two phenolic acids, p-coumaric and ferulic of which Mercurialine is toxic to vertebrates (Bate-Smith, 1962; Forsyth, 1968; Dumkow, 1969). The data support the view of Lawton (1978) that plant chemistry, although having a profound effect on which species of insects attack each plant and affect the time at which they are able to exploit their host plant(s), have only a small or negligible effect on the total number of insect species that have eventually evolved to exploit a plant.

Fig 1 shows that insect species richness did not increase with increasing leaf area (see Table 1). This pattern may be simply a reflection that many insect species exploit their host plant at the most climatically favourable part of the year. It does seem that the decrease from June to July in the number of species feeding on the plant is maintained, as inspection of the sites at the beginning of August indicated very few species.

Phenology of associated insect species may be partly synchronized with foliage quality. Plants exhibit seasonal changes in the levels of various nutrients in different tissues which have important consequences for many herbivores (McNeill & Southwood, 1978). It is hypothesized that during the period of active shoot and leaf growth in *M. perennis* from spring to early summer, assimilates are translocated from the rhizomes into the above ground biomass and the foliage is nutritionally adequate for adapted insect species. From mid-July onwards progressive deterioration in foliage quality ensues as assimilates are channelled into rhizome formation as a result fewer insect species utilize the plant. Quantitative work would be required to test this hypothesis and to establish the role of other variables.

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BOOK REVIEW

The New Concise British Flora by **W. Keble Martin**, with revised text by Douglas H. Kent, and foreword by H.R.H. The Duke of Edinburgh. Pp. 247, including 94 pages of coloured illustrations and 6 pages of line drawings. Ebury Press and Michael Joseph. 1982. £12.50.

A major revision of one of the most popular records of the British flora, first published in 1965. The colour plates, reproduced from original film with extensive corrections, are according to the publishers a great improvement on earlier printings; the nomenclature to these and the accompanying text has been fully revised.

Major changes have been made to the text, but considerable blank areas (as in the previous edition) could have been profitably used. Incidentally, the publicity material supplied with review copies contains information on the daunting problems faced in preparing both plates and text which would have been of considerable interest to the general reader; it is a pity that this was not incorporated in the introductory matter.

A deservedly popular work which will undoubtedly sell widely, as even those who already possess the original version will certainly wish to acquire it. VAH

THE OCCURRENCE OF *SPEOCYCLOPS DEMETIENSIS* (SCOURFIELD) (CRUSTACEA: COPEPODA) IN THE YORKSHIRE PENNINES

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In 1932 Scourfield described a new species of cyclopoid copepod that he had found on two occasions in a minute trickle of water oozing from a small fissure in the rocks of a cliff face at Tenby, Pembrokeshire. This minute species (length *c.* 0.5 mm) he called *Cyclops demetiensis* and assigned to the subgenus *Bryocyclops*. It is also described in the monograph of Gurney (1933) who used material from the same source and incorporated some of Scourfield's illustrations. Since that time there has been much exploration of underground and interstitial waters and numerous related cyclopoids have been discovered in various parts of Europe from Spain to the Caucasus, and also in Japan. These make up a coherent group whose affinities were recognized by Kiefer in 1937 who erected the genus *Speocyclops* for their reception. More than two dozen species, some with several subspecies, have now been described from Europe alone. The name selected for the genus reflects the subterranean habitats preferred by these copepods and *S. demetiensis* is indeed atypical in having been discovered above ground, though Scourfield was aware of the possibility that it may be a hypogean species that is found at the surface only under certain conditions. All other members of the genus occur in caves, frequent the ground water, or inhabit intersitial spaces between sand grains.

Since Scourfield's discovery *S. demetiensis* has until now never been found again in Britain. However, rather unexpectedly at the time, it was next seen in Greece. The story is rather complex. In 1953 Lindberg described from two caves in Greece a *Speocyclops* to which he gave the name *S. hellenicus*. Subseqently he came to regard this as a subspecies of *S. demetiensis*. Before coming to this opinion, however, he found in a spring in the same country what, in spite of the widely separated localities involved, he recognized as *S. demetiensis* (Lindberg, 1954), a record concerning which he subsequently gave additional information (Lindberg, 1955). Not long afterwards he found populations of a *Speocyclops* in two caves in Crete which he recognized as *S. demetiensis* but which, on the basis of small morphological differences from the Welsh animals, he described as a subspecies, *S. d. acrotirii* (Lindberg, 1955a), a procedure that appeared to have geographical justification. Further exploration of caves in Crete led to the discovery of two more populations, each recognizable by certain minor peculiarities and on which subspecific names, *S. d. sitae* and *S. d. dubiosus*, were bestowed (Lindberg, 1956). However, the describer's confidence in the wisdom of erecting so many subspecies was by now evidently weak for, although he followed this procedure, he suggested that it was perhaps best not to use these subspecific names!

That recognizable local forms are to be found in such an animal, whose populations are widely scattered and likely to be isolated from each other, is not surprising and further evidence that this is indeed the case was provided when what appear to be local forms of *S. demetiensis* were reported from interstitial habitats by a river in Northern Italy (Kiefer, 1968). Although initially content to refer to these simply as *Speocyclops* cf. *demetiensis*, Kiefer was evidently satisfied that they should indeed be assigned to *S. demetiensis* when he listed Italy among the areas from which this species has been recorded (Kiefer, 1978). It has also apparently been seen in North Africa.

One further point calls for comment. A *Speocyclops*, found in Yugoslavia, was described as new by Petkovski (1955) and named *S. montenigrinus*. This he recognized as being very similar to *S. demetiensis* and some of the characters that he regarded as distinguishing between the two, such as body form, are now known to be unreliable and to depend on fixation or to differ in different populations. Indeed Borutskii (1965) regards *S. montenigrinus* as a synonym of *S. demetiensis* though Kiefer (1978) continues to list it as distinct. Whatever its exact status it is clearly a member of what can be called the *demetiensis* complex.

I have recently encountered *S. demetiensis* on two occasions in the Yorkshire Pennines. The first was in April 1981 when one male and one female were found in a muddy seepage on the lower southern slopes of Great Shunner Fell (SD 862958) at an altitude of about 600 m. This was a rushy area with some *Sphagnum* and much brown particulate organic material, the latter so

fouling the collection that the sample was almost poured away. The only associated crustaceans were the copepods *Moraria sphagnicola* Gurney, of which two individuals were found, and *Acanthocyclops languidus* (Sars). No adults of the latter were obtained but several were reared from nauplii kept with some of the detritus in the hope that nauplii of *S. demetiensis* may also have been present, but in this I was disappointed. A return visit to the same area failed to produce any further specimens. It was not even certain that the exact site was relocated as the area abounds in very similar seepages.

The other site was near the upper reservoir at Gorple (SD 922317) where in June 1981 a single male was found among sodden *Sphagnum* in a wet area with abundant rushes, *Sphagnum*, *Polytrichum* and some *Eriophorum angustifolium*. Here its immediate associates were *Moraria brevipes* (Sars) and *A. languidus*. No chemical data were obtained from the exact site but the pH was 3.85 in an adjoining expanse of *Sphagnum* and associated vegetation, and all the crustaceans found in the general area could be categorized as acidophiles.

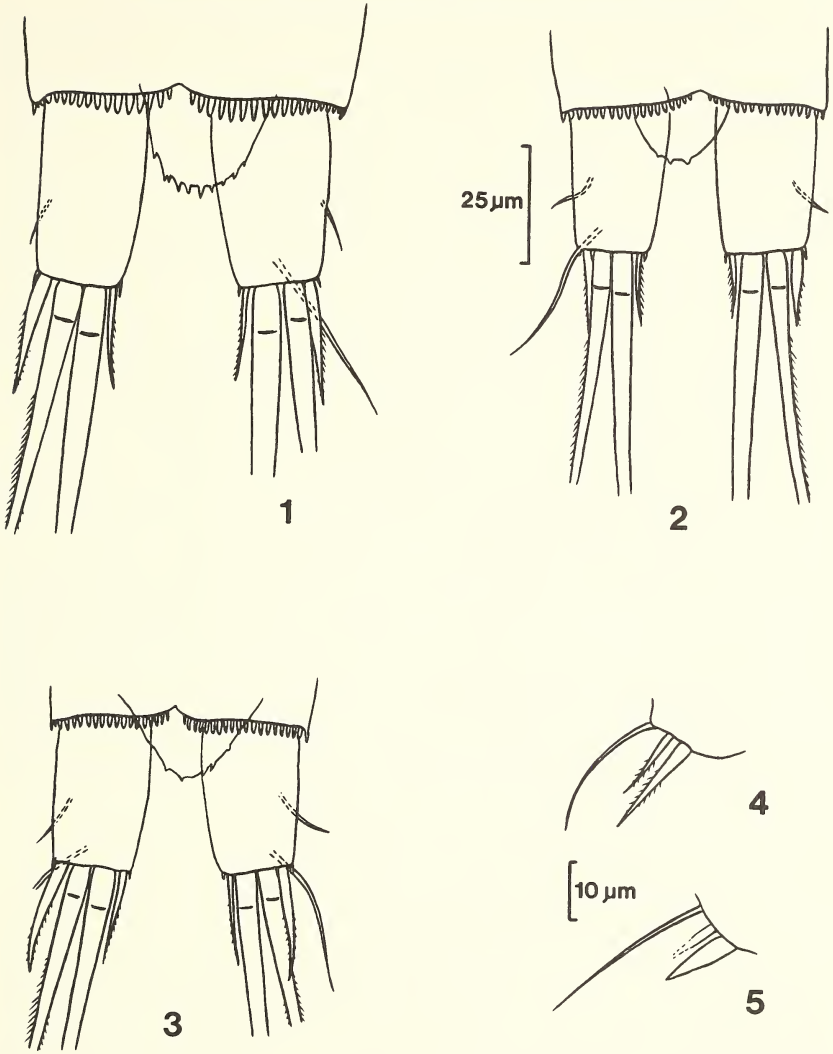
As many Pennine seepages have been sampled without encountering it, it may be that *S. demetiensis* is truly rare in that region. On the other hand it may have subtle requirements and be plentiful in places where these are met. Considering the large amount of potentially suitable habitat for so minute a crustacean, sampling must be regarded as inadequate and it is premature to be dogmatic in this respect.

Like certain other species of *Speocyclops*, *S. demetiensis* is subject to considerable morphological variation. Morphological differences between populations found in different parts of its extensive range should cause no surprise and, considering its minute size, it is not particularly surprising that two subspecies should have been recognized in separate cave systems in Crete. However, intra-population variation is also exhibited and is such as to throw doubt on the validity of some subspecific diagnoses. This is so in the related *S. racovitzai* Chappuis of which two subspecies have been described from one cave system and two others from another. That *S. demetiensis* is variable was made known by Scourfield (1932) in his original description. Thus it displays variation in the form and armature of its conspicuous toothed operculum, a structure that immediately distinguishes it from any other British cyclopoid copepod save *Graeteriella unisetiger* (Graeter) (= *Cyclops unisetiger*). The operculum is described by Scourfield as 'semicircular or slightly elongated, bordered with teeth variable in size, number and position'. Some of this variation is indicated in his illustrations. Likewise the illustrations of the operculum of animals from Greece and Italy given by the authors cited above show great variation. The Yorkshire material also displays considerable variation in this respect (Figs 1–3): the operculum of the only female (Fig 1) most nearly approaches that of Pembrokeshire animals illustrated by Scourfield and by Gurney; the opercula of the two males (Figs 2 and 3), especially in the case of the individual from Great Shunner Fell (Fig 2), are less ragged, that of the latter (associated with a female with a much serrated operculum) being only sparingly toothed.

All specimens have an inner furcal seta shorter than the outer spine but there appears to be variation in the relative lengths of these structures, the inner seta being relatively shorter in the specimen from Pembrokeshire figured by Scourfield than in the available Yorkshire material which, however, is closely resembled by a specimen from Pembrokeshire figured by Gurney. The length of these structures relative to that of the furcal rami is also variable, being relatively longer in the Gorple than the Great Shunner Fell male.

The nature of legs five and six is a characteristic feature of the genus, but again there appears to be intra-specific variation. Thus in neither sex have I been able to detect setules on the slender outer seta of leg six (Figs 4 and 5) though such are shown by Scourfield. Such differences, however, are trivial.

What might appear to be an important point of difference between the Welsh and Yorkshire populations is that for the former no mention is made of any sign of subdivision of the genital segment of the female, whereas in the only female available from Yorkshire a distinct suture is visible dorsally and laterally. The presence of such a suture was indeed one of the factors that led Lindberg (1953) initially to recognize as a distinct species what he later called *S. d. hellenicus*, and Kiefer (1968) felt that particular attention should be paid to this point in future work on the genus. However, Lindberg (1954) subsequently found a population of *S. demetiensis* at Delphi in Greece in which he described the line of suture as being visible ventrally and laterally, as it is in



Speocyclops demetiensis 1 Furcal rami and operculum, ♀, Great Shunner Fell. Ventral; 2 The same, ♂, Great Shunner Fell; 3 The same, ♂, Gorple; 4 Leg 6, ♀, Great Shunner Fell; 5 Leg 6, ♂, Gorple.

Note: In Figs 1–3 the rami are drawn as if they were transparent to reveal the full extent of the operculum that lies beneath them. The apparent asymmetry reflects the fact that they were prepared from mounted individuals and is an artifact. Dorsally the marginal denticles of the last abdominal segment are fewer and larger than they are ventrally.

the Yorkshire female. Referring to this population he later implied that there was variation in this respect, the condition noted here apparently being demonstrated only by some of the females (Lindberg, 1956). He also noted that in another population the suture was entirely absent dorsally or visible only laterally and in yet another population the suture was even more evident than in that at Delphi, two segments being recognizable. This, he inferred, was a case of retarded development revealing a primitive condition, and suggested that the condition of the genital segment in this respect is unreliable as a taxonomic character. One should therefore not attach much taxonomic significance to the difference in this respect between individuals from the two British populations from which females are known. *S. demetiensis* is clearly a variable species and differences between widely separated, and probably effectively isolated, populations are therefore to be expected. With only one female available it is impossible to say anything about variation within the Yorkshire populations.

A word about ecology is called for. The distinction of *S. demetiensis* as being the only species of the genus found in epigean habitats is emphasized by the recent finds. Scourfield (1932) suggested that it was really living in fissures in the rocks and only appeared where he found it because certain unspecified conditions prevailed there. He also suggested that it is not a moss-inhabiting form as much effort had even then been devoted to the search for copepods in moss without finding it. Lindberg (1954) found it in a rheocrene spring in Greece, evidently with a basin of some sort attached or excavated near the source, in which, as the animals were numerous, he inferred that breeding was taking place above ground (Lindberg, 1955). In neither of the Yorkshire habitats does there seem much possibility of the animals having been derived from truly subterranean habitats. Both are moorland areas. The Great Shunner Fell site lies well above the limestone on which the mountain sits so washing out from fissures can be ruled out. Both sites, however, give scope for leading an almost burrowing existence amongst *Sphagnum* and the roots of rushes and among the organic detritus that accumulates in such places. The harpacticoid copepod *Moraria brevipes*, with which *S. demetiensis* was found associated at Gorple, leads such an existence. Of its other associates, *Acanthocyclops languidus* is a tolerant species with a distinct preference for acidic conditions. *Moraria sphagnicola*, a seldom recorded species known only from the British Isles, is particularly associated with *Sphagnum* as its name suggests. The two Yorkshire habitats, both epigean and acidic and located in upland regions, stand in strong contrast to the subterranean and interstitial situations also frequented by *S. demetiensis*. The subterranean habitats in limestone areas are presumably alkaline. It would thus appear that this remarkable little copepod is in some respects as tolerant in its ecology as it is variable in its morphology.

Speocyclops is related to other small, creeping, cyclopoids which often have moss-frequenting or other specialized habits. These are now assigned to genera that appear to have a geographical as well as a morphological basis and include *Bryocyclops* to which, as a subgenus, Scourfield first assigned *S. demetiensis*. Because these are mostly tropical in distribution Kiefer (1937) regards the Palaearctic genus *Speocyclops* as consisting of Tertiary relicts. The occurrence of most species in caves and interstitial waters of southern Europe is in keeping with this suggestion. *S. demetiensis*, however, is atypical, not only in being the only species found above ground but because it occurs further north than any other European species. The new records extend its range a little further north. If a true relict — a status that it is either difficult or unnecessary to claim for most British freshwater copepods — its ability to penetrate subterranean habitats may have played a significant part in its survival here during the glacial period. Its wide ecological tolerance and its successful colonization of, or persistence in, northern regions suggests that it is the most adaptable member of its genus yet encountered.

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BOOK REVIEWS

Darwin by **Jonathan Howard**. Pp. 102. Oxford University Press. 1982. £1.25.

Pictorially, Darwin has taken a beating in the year of the centenary of his death. The commemorative postage stamps, although the first British ones ever to celebrate a scientist, were, as representations of the great naturalist, a complete disaster. Not one of the publishers of the many books about him seems to have chosen to show him as anything but a very old man, and on the cover of this one his picture has been broken up into little squares in various shades of grey and looks rather like a Baird-style television transmission *aetat* 1930. In addition to his accounts of the *Beagle* voyage, the *Cirripedia* and the *Origin of Species*, Darwin produced a major work about every two years from 1860 until his death, so Jonathan Howard has set himself an impossible task in attempting to summarize this achievement in less than a hundred pages. His very brief account of the 'life' is acceptable, except for his statement that Darwin *uncritically* underwent quack cures (what other kinds were there in his day?); in fact he approached his illness scientifically, taking careful notes, and rejecting treatments as they proved valueless. The book gives a satisfactory outline of Darwin's evolutionary theories, and rightly dismisses the polemics of the creationists that are prevalent in some quarters today. It is a pity however that despite the publishers' claim of 'plain language' they have not pruned at least some of the author's irritating rhetorical flourishes.

FHB

Spider Communication edited by **Peter N. Witt** and **Jerome S. Rovner**. Pp. 440, including numerous text illustrations. Princeton University Press. 1982. £21.10.

The results of the application of modern scientific technology to the investigation of spider physiology and communication have led to a new interpretation of the spider as a living organism and its part in its various ecosystems, and a dozen research arachnologists have contributed to this symposium on the behaviour of spiders.

The book gives us a lucid, clearly illustrated and eminently readable account of the mechanisms and ecological significance of spiders. The general reader is given a detailed account of the structure and physiology of receptor organs such as the eyes, trichobothria, sensillae, lyriform organs, and claw slits, some of which are unique to the Arachnida. Signalling mechanisms are described — visual, auditory, vibratory and chemical, with particular reference to the special role played by silk as a somewhat unexpected means of communication. The purposes of communication and their ecological significance are extensively treated. The spider is different in so many respects from insects and other invertebrates that the symposium is full of unexpected facts, new techniques and an abundance of fresh lines of enquiry that are opening up for research.

This book is essential reading for anyone wishing to understand more fully the spider's behaviour patterns in the detection of prey, in sexual display and response, and in social concepts such as territory and the prevention of cannibalism. This publication is of as great importance to the spider specialist as it is to the general research worker in invertebrate behaviour.

CJS

Birds of the World — a Checklist by **James Clements**. Pp. xxxviii + 562. Croom Helm. 1981. £11.95.

As its title states, this is simply a checklist of all the *ca* 9000 bird species known to science. A short introduction is followed by lists of major references and field guides used in its compilation, orders and families, species that have become extinct (or presumed so) since 1600, birds known only from a single specimen, hypothetical and doubtful species and probable hybrids and races. It claims to follow the most recent findings on classification which by now will no doubt have changed. The main checklist gives a computer coding for each species, the scientific and vernacular names and a brief statement on distribution. There is a space in which one can enter the date and location of each species seen which is of doubtful value.

This is an expanded version of Gruson and is certainly a useful reference work for those who like to know about orders and families and who keep a world list. A claim on the dust jacket that Clements is 'one of a handful of naturalists to have seen and identified all known species of birds in their natural habitat' is scientifically incorrect, physically impossible and rather mischievous in my opinion.

JRM

The Breeding Birds of Europe — A Photographic Handbook by **Manfred Pforr** and **Alfred Limbrunner**. Part 1, Divers to Auks. Pp. 333, with many colour photographs. Croom Helm. 1981. £14.95.

Simply a vehicle for the many colour photographs of this interesting and very photographic group. Fifteen pages of simple line drawings of each species precede the photographic section and are of dubious value. Most species have four photographs comprising a full page portrait and three smaller ones depicting the nest and eggs or different postures. The text deals mainly with the breeding aspects: plumage descriptions would have been superfluous when the photographs are so good. A coloured map shows breeding distribution, and information is provided on body length, length of wing, weight, call, breeding period, size of clutch, colour of egg, size of egg, incubation and fledging periods. Most of this is totally unnecessary and has an unhealthy oological flavour. At £14.95 the book is rather an expensive luxury but the photographs are, with few exceptions, some of the best available; the one of a pair of Egyptian Vultures at the nest with their chick and the shell of a tortoise is fantastic and not something one sees every day. On the whole an interesting book but I couldn't rid myself of the feeling that there had been a struggle with the text to justify the photographic element; not a unique situation these days.

JRM

Birds of the Arabian Gulf by **Michael C. Jennings**. Pp. 167, with 12 colour plates by C. J. F. Coombes, and several line drawings. Allen and Unwin. 1981. £9.95.

This book is one of a series on the natural history of the Arabian Gulf which has included the mammals, reptiles and seashells amongst others. It includes all the birds known to have occurred in the Gulf States and deals briefly with the geographical features of the area, migration, human pressures, historical notes and an appeal for assistance to fill the notable gaps in knowledge. A section on where to watch birds in the Gulf lists the best places to go in each state. The main section deals with the breeding birds and lists some ninety species giving the usual brief notes on plumage, behaviour and nesting. Five pages are devoted to information on the local societies and the relevant literature and a tabulated checklist of all recorded species for each state concludes the book.

JRM

Birdwatch Round Britain by **Robert Dougall** and **Herbert Axell**. Pp. 191, with many line drawings and maps, plus twelve colour plates. Collins. 1982. £8.95.

Writer and broadcaster Robert Dougall and reserve management specialist Herbert Axell have combined to present a selection of their favourite reserves. Whilst admitting to a suspicion that the authors have jumped on the wildlife band wagon I warmed to their easy style and the interesting content after reading several chapters. Pleasant line drawings by Robert Gillmor head each chapter, almost essential it would seem for a well presented natural history publication these days. The twenty-four chapters follow a similar pattern: reserve information, local history, places of interest within the area plus a brief description of a particular species, usually the 'star bird' of the reserve. The chapters cover at least sixty major sites along with a special summary of the London area.

The book is clearly aimed at the less experienced birdwatcher favouring particularly those within easy reach of the south and east coasts; the remainder of Great Britain receives a somewhat uneven coverage apart from the islands off the Welsh coast, and Yorkshire, for example, can only offer Bempton Cliffs. In conclusion, the book contains plenty of information for the beginner and would make a useful reference for the more experienced; I would not however consider it essential reading.

MFB

Flights of Imagination compiled by **Mike Mockler**. Pp. 128, illustrated in colour. Blandford Press. 1982. £7.95.

This is an illustrated anthology of bird poetry. The poems are mostly pretty sentimental stuff, for instance *From troubles of the world/I turn to ducks, Beautiful comical things*. Readers of the satirical magazine *Private Eye* will recognize the following (about a dying blackbird) which begins *My wife saw it first/I was reading the evening paper./Come and look, she said./* and ends *This evening/I find it difficult to concentrate/on the paper/* as a parody (? intentional) of E. J. Thribb. Other contributors get into diffuculties with their allusions; one writes of a cock pheasant *Blind to the hunter's powder horn*. Hunters still carry horns, but not powder ones, and they don't hunt pheasants; a shooter is meant (he is illustrated in modern dress, wading for some reason waist-high in ripe corn), and they have been using cartridges for a century or more. The paintings reproduced with the poems are pretty sentimental too; the picture of an owl inevitably shows a crescent moon, and the ledge of building on which a dozen starlings are roosting is spotlessly free from the filth that the birds deposit where they rest. Not a book for naturalists, unless they are of a very sentimental turn of mind.

FHB

John Clare's Birds, edited by **Eric Robinson** and **Richard Flitter**, with illustrations by **Robert Gillmor**. Pp. xxii + 105. Oxford University Press. 1982. £6.95.

The nature writings of John Clare (1793–1864) will be familiar to most naturalists, and loved by many. This selection of his bird poems and prose have been expertly edited by the felicitous collaboration between the eminent Clare scholar Eric Robinson and the well-known naturalist Richard Fitter who have retained Clare's original spelling and use of vernacular names, which have a charm and interest of their own, and have supplied glosses where necessary. Modern and Latin names are provided to aid ornithological identification. The editors have also written an interesting and informative introduction which includes an appraisal of Clare as a naturalist. The text is sensitively illustrated with drawings by the wildlife artist Robert Gillmor.

A splendid anthology which will delight not only ornithologists but also lovers of the English countryside and its natural history.

MRDS

A Scottish Naturalist — the sketches and notes of Charles St John 1809–1856. Pp. 192, with several colour plates and many vignettes. Andre Deutsch. 1982. £10.95.

Charles St John was one of the greatest writers on natural history subjects in the Victorian age and this volume collects together some of his essays and field notes which are presented as monthly diaries. It is, in essence, the account of a country gentlemen, sportsman and naturalist

in the Scottish Highlands over a hundred years ago and is full of anecdotal tales so typical of the period which rely on the telling for their excitement; one feels the actual incidents would have been much less dramatic if viewed through modern eyes. For 21 June 1851 he writes 'While I was shooting rabbits near the Loch of Spynie, I saw a small bird fly over my head: I called out "A rose-coloured starling!" and shot at it, bringing it down beautifully clean and scarcely injured. It was flying in company with two other starlings *apparently of the ordinary colour*, which escaped so that *I could not ascertain whether they were young of the same species*, or common starlings.' [my italics] St John was a self-taught artist and the book is liberally decorated with his pen and pencil sketches. For those who have regard for the evolution of field naturalists and those who like to drift into those spacious days when the frustrations and politics of modern natural history were not a problem, this book is well worth the price.

JRM

Seals and Man. A Study of Interactions by **W. Nigel Bonner**. Pp. xii + 170, including line drawings and b/w plates. University of Washington Press. 1982. $9.95 paperback.

Nigel Bonner, who is currently head of the Life Sciences Division of British Antarctic Survey, began studying seals on South Georgia in 1953. Since then he has been involved with them almost continuously in one hemisphere or the other; few scientists can provide a better overview of this extraordinary group of marine and freshwater mammals. This book, based on nine lectures given to the School of Fisheries, University of Washington, is a distillation of his views on management problems and exploitation. I hope that British universities have been as ready to hear him as this distant university of the western United States, for his message is sensible and well-balanced, and relevant to our own problems of seal management. Chapters 1 and 2 outline the structure and evolution of the group, and the history of its exploitation by man. Chapters 3 to 5 deal with exploited stocks — Northern and Southern Fur seals, Harp seals and Elephant seals especially — and Chapter 6 covers species of the Antarctic that are ripe for exploitation — notably the Crabeater, which is probably the most numerous of all the world's species. Chapters 7 and 8 explore rivalries between seals and men for their common food — fish; his comments on the Grey seal controversy are well informed, and should be required background reading for anyone taking an active role in the dispute from now on. Chapter 9 illustrates indirect human impacts on seals — the effects of pollution and fishing nets, fishing, disturbance and other factors that affect seals, including the beneficial effects of whaling, and human protection of seal stocks that have in the past been at risk. The writing is sometimes ponderous ('A willingness to consider resource allocation based on improved multispecies models may do much to ensure the survival of seal stocks.') but always clear and well informed. The diagrams are well chosen, there are good lists of references following each chapter and the index is adequate. I hope this book finds a wide circulation in Britain, to be bought by students, naturalists, administrators and conservationists who have the interests of seals at heart.

BS

CONTRIBUTORS

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BRITISH RED DATA BOOK — INSECTS

Many countries have produced *Red Data Books* listing the fauna and flora under threat from environmental changes. In Britain the first of these for the Vascular Plants was published in 1977. Since then similar *Red Data Books* covering other groups have been in preparation.

The *Insect Red Data Book* is being prepared by a small committee sponsored by the JCCBI and chaired by Dr M. G. Morris. The editor is Mr P. T. Harding, to whom all correspondence should be addressed at the Institute of Terrestrial Ecology, Monks Wood Experimental Station, Abbots Ripton, Huntingdon, Cambridgeshire PE17 2LS. All groups have been considered but only some Orders justified detailed treatment. These are the Lepidoptera, Orthoptera, Odonata, Trichoptera, Hymenoptera, Coleoptera, and Diptera.

This *Red Data Book* will be invaluable in drawing the attention of entomologists, conservation bodies, landowners, and planning authorities to the problems of insect conservation.

SOME OXFORDSHIRE TREES

Visitors to Stonor Park and Bix Bottom Nature Reserve in the Thames Valley (see *The Naturalist* **107**: 102) are within easy reach of the grounds of Fawley Court which are now open to the public in the summer months. Fawley Court is on the river one mile from Henley-on-Thames, and has a long history. Amongst other famous visitors over the centuries, William of Orange stayed in the house on his way from Torbay to London in 1688. It is a Wren building with the remains of Norman work in the cellars, and is now a Roman Catholic school for Polish boys. It houses a museum of Polish art, books, weapons and armour. The grounds are remarkable for the collection of old trees. The foliage of the large number of holm oaks *(Quercus ilex)* was badly damaged in the winter of 1981–82, but the trees are now recovering. They may date from 'Capability' Brown's landscaping of the grounds in 1771, but the other large trees, for instance *Robinia pseudacacia*, *Sequoiadendron giganteum* and *Cupressus sempervirens* were probably planted in the fifties of the last century. There are magnificent specimens of Oriental plane *(Plantanus orientalis)* and swamp cypress *(Taxodium distichum)*. Other trees of particular interest are *Fagus sylvatica* 'asplenifolia' and *Staphylea pinnata*.

FHB

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THE NATURALIST

A Quarterly Journal of Natural History for the North of England

Edited by M. R. D. SEAWARD, MSc, PhD, DSc, FLS, The University, Bradford

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PUBLISHED BY

THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 17p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

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Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

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THE YORKSHIRE NATURALISTS' UNION

THE STATUS OF *MELANARGIA GALATHEA* (LEPIDOPTERA: SATYRIDAE) ON THE YORKSHIRE WOLDS

R. W. RAFE and R. G. JEFFERSON

Department of Biology, University of York, Heslington, York

The Marbled White butterfly (*Melanargia galathea* (L.)) inhabits rough grasslands, with a tendency to be most abundant in chalk or limestone habitats. The adults are on the wing during July and August and the female drops eggs amongst the grass whilst she is flying. The butterfly is univoltine and overwinters as a first instar larva. Larval foodplants include *Dactylis glomerata*, *Phleum pratense* and *Festuca ovina* (Frohawk, 1934; Higgins and Riley, 1980), but the larvae will feed on any grass species under laboratory conditions (Howarth, 1973). Frohawk (1934) suggests that the adults use thistles as their main nectar source, and personal observation indicates a preference for purple flowers in the families Compositae (*Cirsium eriophorum*, *C. arvense*, *Centaurea nigra*) and Dipsacaceae (*Knautia arvensis*).

M. galathea is found throughout Western Europe (excluding Scandinavia) and in North Africa, and in Britain is primarily restricted to Southern England and parts of the Midlands (Fig 1). It was formerly more widespread in Britain but has disappeared from many eastern and northern localities, although it still occurs on the Yorkshire Wolds, some 150 km from the nearest population to the south. Turner (1973) states that *M. galathea* was also once found on the Oolitic limestone of North Yorkshire, to the north of present populations.

Table 1 summarizes published records of *M. galathea* in Yorkshire (most refer to the Wolds), extracted predominantly from *The Naturalist*, 1862 to the present. These records indicate fluctuations in numbers, with at least two periods of extreme scarcity or possibly extinction, prior to 1891 and prior to 1945. Skelton and Heath (1975) record *M. galathea* from three 10 km squares (SE 85, 86 and 96) in Yorkshire; these squares correspond to the map presented by Turner (1973). A recent interim distribution map supplied by the Biological Records Centre in 1982 indicates that the 10 km square distribution recorded since 1970 has changed (Fig 1), with occurrence again in three squares (SE 86, TA 07 and 08), two on the Wolds and one near Scarborough.

During the summer of 1982, we were engaged in botanical surveys of chalk grassland throughout the Yorkshire Wolds, RWR looking at the dry valley systems and RGJ surveying disused quarries and pits as well as roadside verges. *M. galathea* is easily identified and conspicuous where it occurs, and a note was kept of all sightings. These observations provided an opportunity to assess the present status of *M. galathea* on the Wolds of North Yorkshire and North Humberside.

Figure 2 outlines the chalk outcrop of the Wolds, bounded to the west and north by scarp slopes, and to the east by an overlay of boulder clay. Sightings of *M. galathea* are plotted on a 1 km square grid. The records include, in addition to our own sightings, other recent and past records obtained from personal communications, the chalk grassland files of the Nature Conservancy Council and those sources indicated in Table 1. There seem to be three existing 'population centres', marked A, B and C, with some evidence of now extinct fourth (D) and fifth (E) populations centred on the dry valley systems around Fordon and Sledmere. Population A, north, south and west of Fridaythorpe, is geographically extensive with sightings of *M. galathea* from many separate valley systems, roadside verges and a disused railway line. The butterfly was very abundant at several localities within this region. Populations B and C each represent sightings from valley systems where the butterfly was neither as numerous nor as widespread as population A.

The 1982 records suggest that *M. galathea* is relatively abundant at certain localities on the Wolds. However, it must be realized that 1982 was an exceptional 'butterfly year'; this is reflected in the returns from the butterfly monitoring scheme conducted by the Institute of Terrestrial Ecology (Pollard, *pers. comm.*). In some recent years *M. galathea* has become extremely scarce on the Wolds (Usher, *pers. comm.*) and the records documented in Table 1 appear to indicate that such fluctuations in abundance have occurred throughout the last century.

The Yorkshire Wolds is predominantly an area of intensive arable farming. Extensive areas of rough grassland are now restricted to the dry valley systems, with smaller areas along roadsides and disused railways, and in disused quarries. Many former areas of such grassland have now been improved and are under a heavy grazing regime. Other areas of dry valley grassland have been lost due to scrub invasion, ploughing and afforestation. Comparison of land utilization data from the 1960s (Second Land Utilization Survey of Britain) and 1982 (Jefferson, unpublished) based on a random sample of 2 × 2 km squares, covering a total of 120 km^2, on the chalk of the Wolds revealed a 43 per cent loss of unimproved grassland in the twenty-year period.

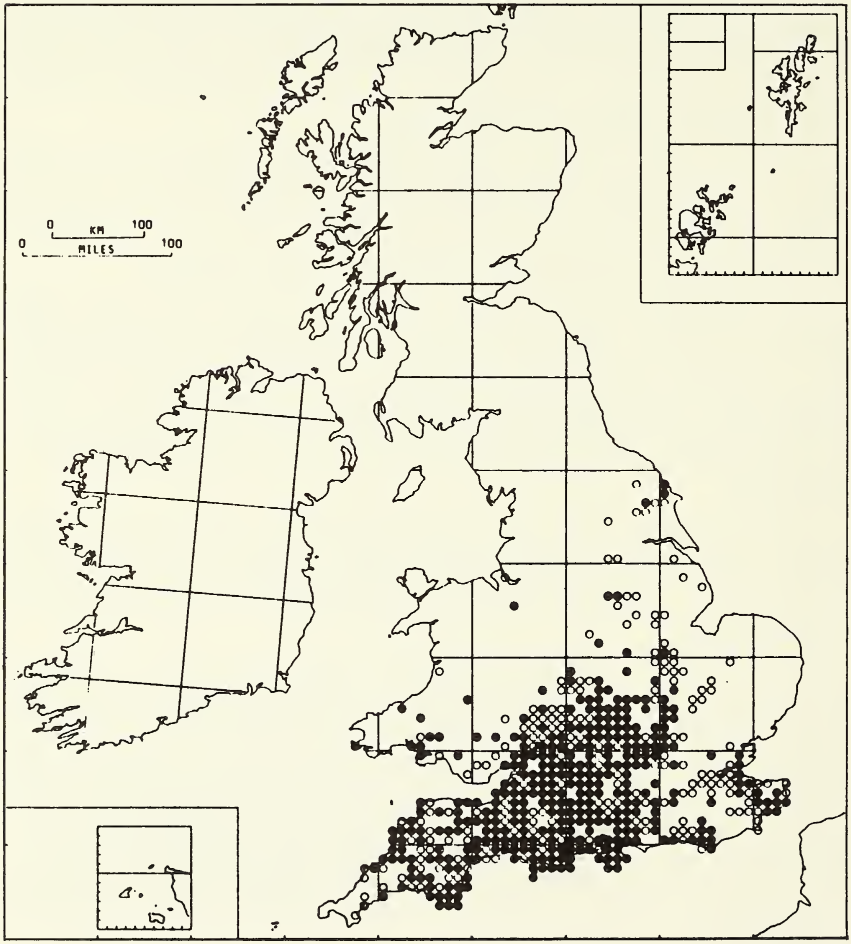

FIGURE 1

Distribution, by 10 km squares, of *Melanargia galathea* in the British Isles.

○ To 1970

● 1971 onwards

Map supplied by Biological Records Centre, Institute of Terrestrial Ecology.

TABLE 1

Published records referring to *M. galathea* in Yorkshire

Year	Source	Notes
1884	*Naturalist*, 1884/1885 p. 183	*M. galathea* appears to be extinct in Yorkshire.
1891	*Naturalist*, 1891 p. 300	*M. galathea* was found on the Yorkshire Wolds near Sledmere. It was previously thought to have been extinct for more than twenty years.
1900	*Naturalist*, 1901 p. 363	Sleightholmdale, near Helmsley.
1901	*Naturalist*, 1901 p. 291	Near Scarborough.
1902	*Naturalist*, 1902 p. 302	Thirty seen on the wing in a locality 'within easy reach of York'.
1903	*Naturalist*, 1904 p. 32	'Well established in the same locality as last year and has been so no doubt for ages'.
1929	See 1944	
1944	*Naturalist*, 1945 p. 32	*M. galathea* seen in Falsgrave Park near Scarborough. First local record since 1929.
1945	Ford (1945)	It has long ceased to occur in Yorkshire where it was once known.
1945	*Naturalist*, 1946, p. 42	Scarborough.
1946	*Naturalist*, 1947, p. 31	Several records of *M. galathea* on the Wolds.
1948	*Naturalist*, 1949, p. 46	One individual seen at Keld Head, Pickering.
1951	Blackie (1951)	Once common, then absent in parts of Yorkshire, it is now reappearing there.
Undated but before 1963	Lepidoptera Committee of the Yorkshire Naturalists' Union (1967)	Records from Fridaythorpe, Ganton, High Fordon, Langtoft, Sledmere and Weaverthorpe (Yorkshire Wolds).
Undated but before 1963	Lepidoptera Committee of the Yorkshire Naturalists' Union (1967)	Records from Cayton Bay, Helmsley, Pickering and Scarborough.
1963	*Naturalist*, 1964 p. 24	Common in one locality near Sledmere, and also at Burdale.
1963	Lepidoptera Committee of the Yorkshire Naturalists' Union (1967)	Cowlam and Burdale (Yorkshire Wolds).
1964	*Naturalist*, 1965 p. 21	One individual seen in a sand pit near Staxton (Yorkshire Wolds).
1965	*Naturalist*, 1966 p. 19	One individual at Burdale.
1966	*Naturalist*, 1967 p. 19	Not uncommon at Burdale and Cowlam.
1967	Lepidoptera Committee of the Yorkshire Naturalists' Union (1967)	*M. galathea*: A number of healthy colonies principally on the chalk Wolds of the East Riding where it is sometimes plentiful.
1968	*Naturalist*, 1969 p. 18	Several individuals seen emerging at Burdale, and a new colony at Warrendale.
1970	Rutherford (1971)	Fair numbers on a dull day at Burdale.
1973	Turner (1973)	Two colonies on the Yorkshire Wolds.

However, many apparently suitable areas of grassland on the Yorkshire Wolds remain unoccupied by the butterfly. Blackie (1951) posed the question as to why *M. galathea* should be so restricted when its habitat and larval foodplants appear to be widespread. The question remains unanswered. *M. galathea* is here on the northern edge of its range in Europe, and climatic factors may well be important in determining its local distribution. Dennis (1977) stated that *M. galathea* requires warm, dry conditions. Turner (1973) suggests that at the northern edge of its range, *M. galathea* will be largely restricted to south facing slopes: within our observations, it was certainly at its most numerous on several slopes with a southerly aspect. An isolated population on the edge of a species range, such as that for *M. galathea* in North Yorkshire, is of ecological and conservation interest. An understanding of the factors that prevent the geographical expansion of this species may help in its conservation, both here in Yorkshire and elsewhere. In addition man-induced extinctions of peripheral populations simply represent further erosion of the species geographic range. Isolation may also have interesting genetic implications.

Objective conservation management of these northern populations of *M. galathea* is hindered by the lack of understanding of the species autecology.

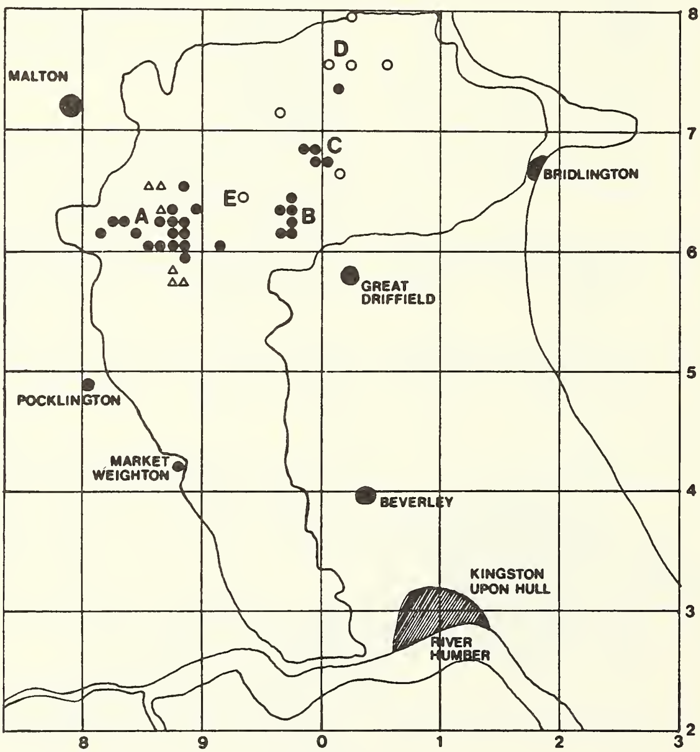

FIGURE 2

Distribution, by 1 km squares, of *Melanargia galathea* on the Yorkshire Wolds.

○ To 1975

△ 1976–1981

● 1982

ACKNOWLEDGEMENTS

The field observations were made whilst RWR was employed by the Nature Conservancy Council and RGJ was in receipt of a studentship from the Natural Environment Research Council. Additional personal records were supplied by Dr M. B. Usher and Mr P. Winter. The N.C.C. staff in the York region helped in searching for references in their files, and the Biological Records Centre of the Institute of Terrestrial Ecology provided the recent British distribution map. Dr M. B. Usher provided constructive criticism of the text.

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THE PARASITIC COPEPOD *ERGASILUS BRIANI* MARKEWITSCH IN YORKSHIRE: AN ADDITION TO THE BRITISH FAUNA.

GEOFFREY FRYER

Freshwater Biological Association, Ferry House, Ambleside

and

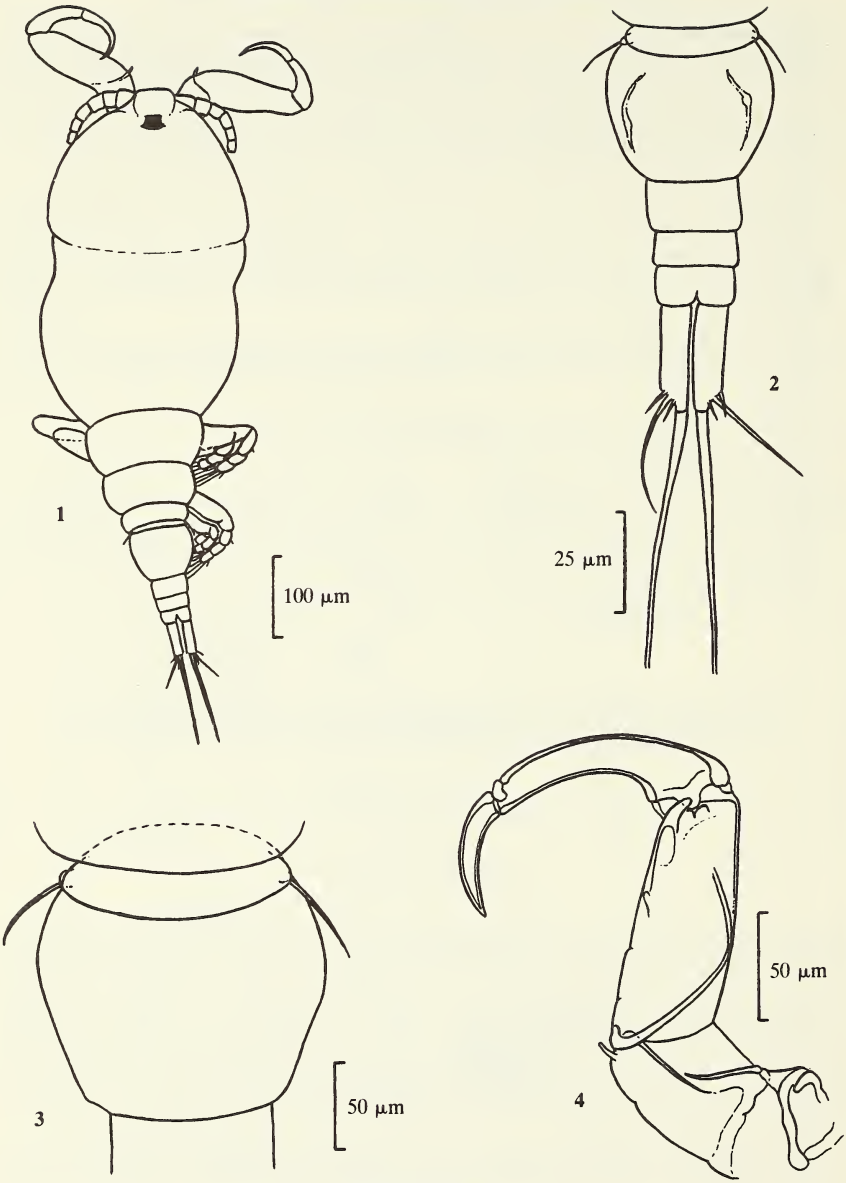
CHRISTOPHER ANDREWS

Yorkshire Water Authority, Leeds

Hitherto only one truly freshwater species of *Ergasilus*, *E. sieboldi* Nordmann, itself probably an introduction, has been recorded in Britain. The little-known native *E. gibbus* Nordmann seems to be essentially a brackish-water species. In April 1982, during the course of a routine examination of fishes from Moore's Bakery Pond at Gawthorpe, near Dewsbury, Yorkshire (SE 269222), one of us (CA) encountered a dead bream, *Abramis brama* (L.) from the gills of which he obtained a number of parasitic copepods. These were examined by G.F., who expected them to be *E. sieboldi*. In fact they proved to belong to a species not previously seen in Britain, namely *E. briani* Markewitsch.

On 15 June 1982 the same pond was netted and ten specimens each of bream, roach, *Rutilus rutilus* (L.), and perch *Perca fluviatilis* (L.) were examined. No ergasilids were found on roach or perch but seven of the ten bream were infected with *E. briani*, between two and forty parasites per fish being detected. The pond concerned is heavily stocked with coarse fishes of several species and has been stocked on a number of occasions. The three most recent stockings for which information is available were made between 1976 and 1978, all of them from localities in England. There is no information on any stocking with fishes imported from the Continent.

The taxonomic history of *E. briani* (Figs 1–4) is somewhat confused. First found in Russia, it was mentioned briefly, in Ukranian, by Markewitsch (1932) who, although providing neither



FIGURES 1–4
Ergasilus briani

Figure 1: Adult female, dorsal. Legs 3 and 4 of left side omitted to reveal the minute leg 5. Setae of antennule omitted. Figure 2: Thoracic somite 5, with leg 5, abdominal somite, abdomen and furcal rami, dorsal. Figure 3: Thoracic somite 5, leg 5 and genital somite dorsal. Figure 4: Antenna.

description nor illustrations, referred to it by the name of *E. briani*, indicating that a description was to follow shortly. This duly appeared the following year, complete with illustrations, in an Italian entomological journal (Markewitsch, 1933) — an unexpected venue for a paper on crustaceans. In a reference to this species shortly afterwards Markewitsch (1934) lists it as *E. briani* 1933, but subsequently (Markewitsch, 1937, 1956) gives it as *E. briani* Markewitsch 1932, the date used by Gusev and Smirnova (1962: transl 1964) and by most of the few authors who have subsequently referred to this species. In fact the Ukranian reference to the name *E. briani*, being unsupported by any description or illustration, is a *nomen nudum*. As the species was first adequately described and illustrated, and therefore validated, in the Italian paper, it should be cited as *E. briani* Markewitsch 1933.

A further complexity arises in that, in 1934, at which time he was unaware of the description by Markewitsch, Halisch described from Germany what he believed to be a new species to which he gave the name *E. minor*. On learning of the existence of the Russian species he obtained material from Markewitsch for comparison with his German animals and concluded that two species were involved (Halisch, 1935). Markewitsch (1937, 1956), however, believes that the distinctions drawn between these allegedly different species are inadequate and that only one species is involved. In this he is supported by Romanovsky (1955) and Yin (1956). Of the differences adduced by Halisch, those of size, body form and shape of the antennae are inadequate as a means of separation. More important is the alleged difference in the armature of the distal exopodite segment of the first leg, which Halisch (1935) claims to bear two spines and four setae in *E. minor* and two spines and five setae in *E. briani*. However, in an illustration of this leg, supposedly of *E. minor*, he later shows the condition displayed by *E. briani* (Halisch, 1939)!

In spite of his failure to maintain the distinctness of his material from *E. briani*, however, Halisch has contributed far more than any other worker to our knowledge of the anatomy and biology of this species. He was, for example, the first to draw attention to the fact that whereas *E. sieboldi* attaches itself to the outside of a gill filament of its host, *E. briani* anchors itself to the inside and is therefore largely hidden between the two rows of gill filaments. This habit, and its usually considerably smaller size, are good indications in the field that one is dealing with *E. briani* (length usually less than 1 mm) and not with *E. sieboldi* (length generally more than 1 mm and as much as 2 mm). The number of eggs in each egg sac is also much smaller in *E. briani* than in *E. sieboldi*, but often exceeds the eighteen or so suggested by Halisch, whose own illustrations indeed show more eggs than this. *E. briani* is also generally less well provided with blue/purple pigment than is *E. sieboldi*.

Under the microscope the most obvious distinction is in the fifth leg (Figs 2 and 3). In *E. briani* this is reduced to a small tubercle bearing a single seta whereas in *E. sieboldi* it is two-segmented, the proximal segment bearing one, the flat distal segment two, setae. The presence of only a single seta on segment 2 of the endopod of legs 2 to 4 in *E. briani* instead of the two setae borne by the equivalent segment in *E. sieboldi* is another unambiguous difference. The abdomen of *E. briani* is also more slender than that of *E. sieboldi*, its furcal rami are longer and, in the material examined, the eye spot is more conspicuous. As Markewitsch (1933) noted, in detached individuals the antennae seem always to be directed forward (Fig 1), which is not usually the case in the genus *Ergasilus*. The presence of what is probably a sensory projection near the inner distal margin of the basal segment of the antenna (Fig 4) also helps to distinguish this species from *E. sieboldi* which has no such structure in that position.

While there is no means of proving this, *E. briani* is almost certainly an introduction to our fauna but may have been present undetected for some time. Since its description it has been found to have a wide distribution in Eurasia, extending from China and Mongolia in the east (Yin 1956, 1962), through Siberia to European Russia, where it occurs in the widely separated drainage basins of the Baltic, Black and Caspian Seas (Markewitsch 1934, 1956; Gusev and Smirnova, 1962, 1964), and extends into Poland, Germany, Hungary, and Czechoslovakia (Halisch 1934, Romanovsky 1955, Markewitsch 1956, Pónyi and Molnár 1969).

Its hosts are particularly, but not exclusively, cyprinid fishes, of which several genera are reported.

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BOOK REVIEW

Elephants by **S. K. Eltringham**. Pp. x + 262 (including 67 figures and black and white photographs and 12 colour plates). Blandford Press, Poole. 1982. £10.95.

This is an informative, up-to-date volume on elephant biology by a leading authority and research scientist on these animals. It contains an excellent balance of approach with topics such as methods of study, morphology, physiology, disease and even ancestry well covered. But it is perhaps the sections on behaviour, ecology and applied problems of management that will attract greatest interest. Here, particularly, the author provides a good readable review incorporating much of his own experience with African elephants. Throughout, he maintains a responsible, detached position, no more so than when he is presenting information on more debatable issues, whether these be scientific, such as the occurrence of population cycles, or more practical, such as whether or not culling should take place. The whole account is supported by simple, clear line drawings, monochrome photographs and high quality colour plates.

There are two areas where I would have liked to see expansion. On a matter of detail, in the adjustments to carrying capacity (Fig. 8.4) proposals were made by Corfield on the consequences of a sudden population decline in Tsavo Park which merit mention. And on a more general point I found the coverage on the Asiatic elephant disappointingly slender. Possibly, little information is available on this species.

Elephants still remain relatively unstudied animals over much of their range and it is very much in their conservation interest that research should be constantly in progress. It is therefore of some concern that a quick count of the publications, in five-year periods, in Eltringham's bibliography suggests a higher output for 1971–75, than for 1976–80. Clearly, the author may, with good reason, have selected more works from the earlier quinquennium. But some of us feel that there is a disturbing decline in research activity in the tropics which cannot be to the long-term benefit to these and other large mammals.

MJD

GEORGE NORMAN OF HULL, 1823–1882

ERIC CHICKEN

The moths which fluttered in the light of George Norman's lantern and escaped his capture can hardly have been more elusive than facts about his life. This account[1] attempts to extend the basic information provided by Sheppard (1900).

William Vernam Norman came to Hull from Lincolnshire; by 1817 he had his own business as a commission merchant, and had married Mary Sophia Scafe of Hull and set up a home at 9 North Parade, Beverley Road, Hull. Nine children, at least, were born to the couple, George, born on 1 January 1823, being the fourth. Little has been discovered about George's childhood save that he had two years of foreign schooling near Hamburg which enabled him to become fluent in German but probably was the cause for his dislike of things Germanic.

Six of the children, including George, never married, surely a high proportion and perhaps indicative of social isolation. The family business prospered, judging by directory entries and the Registry of Deeds. Offices were established by W. V. Norman prior to 1834 in what is now Wilberforce House, which was purchased by the family in 1855 for £3300. The father was a founder member of the Hull Chamber of Commerce and Shipping and Vice-Consul for Hamburg. George was likewise Vice-Consul for the Hanse Towns from 1861 to 1866, but appears not to have had the same enthusiasm for business; however, his natural history benefited from the connections he could call upon.

George Norman, Naturalist

(a) *Flowering Plants*

Norman must have had an interest in flowering plants at an early age, and Robinson (1902), whose Flora gives thirty references for Norman finds, concludes he was preparing lists of local plants 'probably with a view to the compilation of a Flora'; the common date is 1850 and there is an emphasis on plants of wet habitats.

(b) *Ferns*

Little has been discovered concerning Norman's enthusiasm for ferns, but he must have had one of the best collections in Britain since Lowe (1855–60) acknowledges over 130 plants or fronds supplied by Norman. His interest appears to have been horticultural and he must have obtained plants shortly after their introduction to Europe, especially through Booth and Son of Hamburg. In one of the Walker — Arnott letters[2] (1865) he writes in a manner which gives an idea of his standing in the subject.

> 'While in London I came over to Kew to see the ferns. The collection is in a most disgraceful state and I told the curator so. Most of the smaller and more delicate ones I missed altogether and the whole disgusted me. I saw poor[3] Sir W. Hooker and had a short conversation with him.'

(c) *Ornithology*

Norman had a lifelong interest in ornithology; his first letter to *The Zoologist*, written at the age of twenty, referred to the late departure of the swallow. He undertook his own taxidermy and advised others, such as J. Cordeaux. The most interesting of Norman's observations are on the status of the Red Grouse, which he regarded as the same species as the Willow Grouse of Norway. In 1858, he commenced a series of letters in *The Zoologist* on the continuing controversy between lumpers and splitters, and was still arguing his case in 1867. The matter was effectively settled by Salomonsen (1936) who discovered birds of intermediate character on islands off the Norwegian coast. The Taxonomic Subcommittee of the British Ornithologists' Union recommended that the Red Grouse should be regarded as a geographical race of the Willow Grouse in 1956. Norman deserved better support than he got and deserves credit for his stand in the argument.

(d) *Diatoms*

It is in the study of diatoms that Norman made his greatest contribution to natural history. Why or when he turned to this subject has not been determined, but the availability of microscopes and interest in them at the Hull Literary and Philosophical Society may have been reasons.

His discovery, published as 'Notes on Ascidiae as a source of Diatomaceae', resulted from an examination of the stomach contents of sea-squirts which he obtained from oyster shells dredged in the Silver Pits area of the North Sea and sold in the Hull market. His paper 'A list of the Diatomaceae occurring in the neighbourhood of Hull' was read by Dr Lankester to the Microscopical Society in London in 1860. This list contained some 400 entries, which was increased to 480 in 1865. Also in 1860 a paper was read on his behalf to the same society 'On some undescribed species of Diatomaceae'. Thereafter new forms discovered by Norman were published jointly with or by Greville. Species named after Norman included *Auliscus Normanianus* Grev. and *Amphora Normanii* Rabenhorst, and at least a dozen were named by him including *Aulacodiscus Sollittianus*, *Triceratium Harrisonianum* and *T. Dobrèeanum* in honour of three Hull naturalists.

Norman's correspondence was frequent and extensive: a list of some forty of his correspondents has been made and the frequency of writing to Walker-Arnott is every one or two days at times. His need to write seemed almost an obsession, amusingly summed up in a letter dated 31 December 1860 in the words 'In all probability this is the last letter you will receive from me this year'. These letters acted as research notebooks and to some extent substituted for a specialist journal. The wide circle of correspondents were not all diatomists, but included those willing to collect. Norman's determination is shown with some humour in the following passage.

> 'have serious thoughts of addressing Brigham Young for some algae from the Grt Salt Lake in Utah. Perhaps if I address him as a Dearly beloved Brother he may imagine I am connected with his sect. GN might easily be made to spell G. Mormon and this might have the effect of bringing the algae.'

Norman had a good working knowledge of simple chemistry even though his methods seem to lack safety awareness.

> 'I then boiled again in nitric acid and added a pinch of chlorate of potash. This may be against theory but it is nevertheless a capital practice.' After the bottom had fallen out of a test-tube, he wrote, 'the fuming acid flies all over my clothes completely spoiling a new pair of trousers. I lost every piece of the gathering. Is not this enough to make a saint swear?'

Norman's letters reveal many differences of opinion concerning determinations and other matters. To Walker-Arnott's suggestion that diatoms found on mahogany logs from Honduras in timber ponds at Hull docks might be local in origin, he replied:

> 'With my last epistle I thought I had forever settled the blessed mahogany logs affair, by proving to you they . . . grew on the logs. Oh Dear! Oh Dear! 8 pages of blowing up for offering an opinion. But enough of this I am quite satisfied to abide by your advice, "Follow your own method and let me follow mine".'

(e) *Societies*

It was at the height of his work on diatoms that Norman took a leading part in local societies. Sheahan (1864) states that the Hull Micro-Philosophical Society was formed about 1858 at a private residence. By 1860 Norman is reported as being re-elected as president. The society of twenty-two members met fortnightly during the winter and monthly in summer. Norman's attitude to work may have set the pattern, for refreshments of all kinds were excluded. Referring to the Hull Microscopical Society, he states that though often an invited guest, he never joined it because it was too much of a feeding club to his taste. By 1864 the society had changed its name to The Hull Natural History and Microscopical Society, with the intention of admitting members interested in field pursuits.

Norman was a member of the Hull Literary and Philosophical Society and is mentioned for making donations in 1844. In 1864 he was a member of Council and Curator of Zoology. His membership ceased in 1865–66, but he still donated specimens.

Later Years

(a) *Health and circumstances*

The late 1850s and early 1860s must have been Norman's busiest years and included four holidays in Norway. They also saw the death of his parents, two brothers, and two of his valued

correspondents, Gregory and Greville. These depressing events doubtless contributed to a deterioration in his health. As early as April 1860 he wrote:

> 'For some days past I have had little inclination for Diatoms having been suffering from a medley of coughs colds catarrh and lumbago with the usual depression.'

Whether he means depression usually accompanying a cold or his personal usual depression is not clear, but it may be an indication of things to come. By April 1866 he writes from Ben Rhydding near Otley, where he has been staying for a month to improve his health. In June, however, his symptoms returned and he feared he must give up microscopy altogether: 'I am sadly afraid my brain has suffered from too close application'.

He considered a sea voyage and also residing in Scotland and made up his mind to abandon business altogether. In fact he must frequently have been absent, and probably 1867 is the last year in which the family lived at 9 North Parade. He never settled permanently in one place thereafter.

(b) *Forres, Scotland*

The winter of 1866/67 was spent at Ben Rhydding, but he was getting bored; he then stayed at the Hydropathic establishment at Cluny Hill, Forres, until the end of October 1867, from where he wrote 'I am very happy here having after a lapse of 20 years taken again to the Lepidoptera and have got some good things'. Returning to Ben Rhydding for the winter, he wrote 'Natural history notes from Morayshire' for *The Zoologist*. In March 1869 he moved to Crieff, Perthshire, intending to stay the whole season, but it was a poor one and he returned to Forres in July.

(c) *Entomology*

Moths had been an early interest. His second letter to *The Zoologist* tells of his surprise on opening a breeding cage to find *Smerinthus ocellatus* (Eyed Hawk-moth) and *Sm. populi* (Poplar Hawk-moth) united in copula. He hoped to rear some hybrids which would be quite rare. Nine years later, on receiving a fine larva of the Death's-Head Hawk-moth from Thorngumbald, some seven miles from his office he lost no time in walking there.

The greater part of his published collecting, however, was to be done after his arrival at Forres. His 1868 finds are in *The Entomologists' Annual* for 1869, and his lists were to appear in *The Scottish Naturalist* and *The Entomologist's Monthly Magazine*. His search for *Agrotis fennica*, only one specimen had been claimed for Britain, is said by Sheppard to be one of the reasons for going to Canada.

(d) *Canada*

Whatever the reasons — desire for a sea voyage or the colonial life he had hankered after when he had had to enter business, or the influence of Dr Innes of Forres who was in America when a young man, or *Agrotis fennica* — in 1873 he went to western Ontario and spent two years there. In 1874 he was at Spring Bank, St Catherine's and in 1875 at the Couchiching Hotel near Orillia. Soon he had a letter in *The Canadian Entomologist* asking for information about *Agrotis fennica*. During his stay in Canada, Norman found several moths new to the Canadian list and a number of new species; but, as with most of his diatoms, his finds were published by an expert, Augustus R. Grote, Curator and later Director of the Museum, Buffalo Society of Natural Sciences, New York State. Of the new species, two were named after him, *Perigrapha Normani* Grote and *Lithophane Georgii* Grote. A photographic plate taken by Norman illustrating mostly new species was in the Society's journal for December 1875. He contributed a short article on sugaring for moths and this was later reprinted in the *Transactions* of the Hull Club.

(e) *Pitlochry, Scotland*

Norman returned to Scotland in 1875, but still spent some of his winters at Ben Rhydding. At Pitlochry in December 1879 he wrote his list of 126 species of bug found in Perthshire. In a letter to Dr Innes at this time he wrote 'I have my brother and sisters here' which shows there was no family rift.

He was at Pitlochry again in 1881 and for a week he had the company of the noted entomologist H. T. Stainton. In August Norman wrote: 'I feel quite lonely in my walks now having no one to talk insects to.' Another list of insects from Perthshire appeared in the *Entomologist's Monthly Magazine*; it was dated 28 March 1882 and was written from Peebles, where he had gone with the intention of working on the bugs of that district.

(f) *Death, burial and estate*

George Norman died between 5 and 6 pm on 5 July 1882 at the Hydropathic establishment at Peebles, having shot himself. The age first given on the registration of death is fifty-eight years. This is changed in the Register of Corrected Entries to 'about 60 yrs' and here it is recorded that death was suicidal and instantaneous. He was in fact fifty-nine years old. He was buried at Hull on 10 July. There was a short entry in the Deaths column of the *Eastern Morning News* for three days, and a single entry in the *Hull and Eastern Counties Herald*. Only one obituary has been found, in the *Entomologist's Monthly Magazine*. His grave in the family vault in the name of his brother Thomas Arthur has not been located in the cemetery and may not now exist because of improvement of the site by Hull Corporation.

The personal estate amounted to £17,098 4*s* 7*d*. The bulk was bequeathed to the family, but there was a legacy of £500 to Hull Royal Infirmary. Norman's microscope, books and diatom collection went to the Hull Museum (destroyed in 1941). His insect collection, consisting mainly of 2350 hemiptera from Scotland and Canada, was later given by his brother to the British Museum (Natural History).

Any suicide immediately provokes the question, 'Why?' It has been suggested by E. Gillett (*pers. comm.*) that in view of the high incidence of syphilis in the last century and the use of hydropathic establishments that Norman was suffering from the tertiary stage of the disease, and coming to realize this, shot himself. On the other hand, it is clear from his letters he was inclined to extremes of elation or depression, and certainly suffered periods of depression for at least the last fifteen years of his life. His temperament, interests and circumstances cut him off from people with whom he could make close personal attachments. Highly intelligent, he needed constant mental stimulation, for he had once before lost interest for no apparent reason. He may well have committed suicide in a fit of depression.

It is unlikely that the truth will ever be known for there is no record of an inquest being held either at Peebles or Edinburgh, and Scottish law did not require one. There are no appropriate records of the Hydropathic available and it was burnt down in 1905. The local newspaper is unlikely to give details and that for 1882 is missing at Peebles.

Character and Work

The last considerations lead one to attempt an assessment of George Norman's character and work. The photograph at the beginning of Sheppard's account makes it possible to visualize the man. One has the feeling that he was a man of high intelligence, but this is not easy to assess. Certainly he was a keen observer, curious and an experimenter, even upon himself. This may account for him having become a heavy smoker as a schoolboy and certainly it is shown in his attempt to try the intoxicating action, following reported Asian practice, of the Fly Agaric fungus and alarming himself with the consequences. These qualities together with an acquisitive instinct and diligence led to a success which prompted the comment, 'Norman is wonderful among the Noctuae. Where is he to be after them next?' He said of himself:

> 'My temper is naturally hot and peppery and people possessed of such tempers are frequently too impatient of having their errors pointed out'.

Yet one reason he gives for not writing a paper on a topic is that it would 'bring me in collision with old Sollitts'; again, 'I have no reply from him. Perhaps I have spoken too plainly.' This bluntness and honesty combined would not endear him to many. Norman stuck to his opinions, witness the Red Grouse controversy. His independence might be taken for arrogance. When arguing about the nature of 'species' he comments, 'I cannot really see why one man's opinion is to be infallible because he has 30 or 40 years more experience than another.' Against this he obviously consulted other experts and was prepared to admit when he was in error. Indeed at times he appears to deprecate himself unnecessarily.

His attitude to other groups could be severe. He objects to his name being spelt in a Germanic manner.

> 'By the way I had a letter from Rylands who is going to baptise the . . . thing from the . . . Bridge deposit *Orthosira Normanni*. Now this surely is not the correct thing for I had nothing whatsoever to do with the finding the diatom in question nay I had overlooked it even. Surely it should be Normanianus . . . I have written

> him on the point.' 'You say — Normanni is correct. Why the two NN which make me appear a German not at all complimentary to me for I hate and detest the whole german element.'

These quotations also show his sense of fairness and honesty. Norman was hard working and disapproved of those who did not in his judgement do likewise. He gave generously of his time, effort and specimens. Religion does not appear to have taken a prominent place in his life. He was pro-Darwin, writing:

> 'Let truth be searched for irrespective of consequences and when found fearlessly given to the World. Let everything stand on its own merits sink or swim. That is my view and I cannot help saying so.'

His attitude to killing must be judged by current thought. Excessive by our standards, he does not seem to have traded in his collections as many did. After having difficulty in moving a crossbill from its nest and eggs, he records:

> 'I am almost ashamed to say, she fell to my gun. The male bird . . . soon arrived on the scene — alas! soon to be laid alongside his mate. I have little doubt but that these birds are nesting in great numbers in this forest . . . I shall molest them no more.'

Certainly when it came to 'insect pictures' he joins the Editor of the *Entomologist's Monthly Magazine* in speaking against 'The First Great National Entomological Exhibition' for their use and for other reasons, using the expression, 'notoriety is not an equivalent to the loss of self respect'.

Norman's success as a microscopist is indicated by his work with diatoms. He experimented with coloured solutions to alter the wavelength of the light used, but he was not an instrument maker. He used photography as an aid to study and the Walker-Arnott letters contain a microphotograph of a diatom which surely must be one of the first.

There is little doubt about the value of Norman's work in his own day; its value now, of course has changed. D. S. Fletcher (*pers. comm.*) of the Department of Entomology at the British Museum (Natural History) states that both the British Lepidoptera and Hemiptera collections have grown enormously, Norman specimens are but a small part and most British insects can be readily obtained. The Canadian material, however, still represents a useful contribution to the series of N. American Noctuidae. With regard to the diatoms, there is a comment from Norman's own times by W. Hendrey, 'I owe much in these respects (seeking striae) to examples furnished me from time to time by George Norman whose general collection and mastery over these details is without parallel.'

The closing sentence of George Norman's obituary could no doubt equally apply whatever branch of natural science he studied. 'Mr Norman had much of the true spirit of a Naturalist, and was a very courteous and obliging man, thinking no trouble too much if he could thereby serve his friends and the cause of Entomology.'

Acknowledgements

Acknowledgements and thanks go to so many who have been most helpful; librarians, archivists and private individuals, and especially to the staff at the British Museum (Natural History), the Hull Local History Library and the Humberside County Record Office.

Notes

[1] This account is an abbreviated form of an unpublished dissertation by the author for the Diploma in Local Historical Studies of the University of Hull. Full references, bibliographical details and lists appear in that work.

[2] The G. A. Walker-Arnott letters are in the library of the Department of Botany, British Museum (Natural History) and are quoted by kind permission of the Trustees. George Norman's handwriting is difficult to read and some words that proved undecipherable are represented by dots.

[3] Hooker's death took place between the interview and the writing of this letter. This accounts for the use of the word 'poor'.

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BOOK REVIEWS

The Weather Book by **Ralph Hardy, Peter Wright, John Gribben**, and **John Kington**. Pp. 224, including numerous coloured and b/w illustrations. Michael Joseph. 1982. £12.95.

At first sight this large 22 cm × 28 cm glossy volume gives the impression of being 'coffee-table literature'. However, the excellent pictures serve to illustrate a clear, competently written and authoritative text. The book is divided into five chapters. In the first, 'what makes weather' the seasons, the hydrological cycle, and the physical properties of the atmosphere are explored. The second deals with cloud types, rainbows, smogs, thunderstorms, lightning, hurricanes, tornadoes, and other weather phenomena. The world's weather zones are described in the third chapter, which also discusses human and wildlife adaptations to the various climatic areas. The fourth considers climatic change, presents the historic record and hypotheses explaining past events, whilst the final chapter gives and interesting insight into past and present weather forecasting practice. The book is lavishly illustrated and with well chosen and often spectacular colour and black and white pictures, maps and diagrams, of excellent clarity. There is a useful glossary, but the bibliography lists only fifteen other works. Overall it is a very attractive book, clearly presenting a mass of information and considering the abundance and quality of the coloured illustrations it is not overpriced.

DEC

Volcanoes and the Earth's Interior, with introductions by **Robert** and **Barbara Decker**. Readings from Scientific American. Pp. 141. W. H. Freeman. 1982. £14.95 hardback, £6.95 paperback.

This well illustrated volume is a collection of ten papers, originally published in *Scientific American* between 1975 and 1981. Together with the introductions they provide an overview of recent ideas and discoveries in the field of vulcanology and plate tectonics. The papers are divided into three groups: the first deals with volcanoes and plate tectonics, the second with volcanic products such as ash bombs and lava, and the third explains how volcanoes give clues to the nature of the earth's interior. Each of the three sections is introduced by a couple of pages of text which outline important concepts and seeks to draw the articles together.

As the articles were originally independent presentations there is a considerable degree of repetition as each author outlines their own version of the important aspects of plate tectonics. However, this may be of use to students unfamiliar with the concept and if the index to the collected paper is used, a spread of interpretations could be built up. The short bibliography is a useful addition to the original papers, but overall students would probably be better advised to purchase their own selection of *Scientific American* offprints rather than to buy this somewhat expensive volume.

DEC

SOME CHANGES IN AIR TEMPERATURE AND WIND VELOCITY AFTER BURNING OF HEATHER (*CALLUNA VULGARIS*) MOOR AND THEIR RELATION TO MOORLAND SURFACE PROCESSES

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Abstract

To assess the effects of heather removal by burning upon moorland air temperatures and wind velocities, thermograph and wind velocity measurements were taken on the North Yorkshire Moors. One probe of the thermograph recorded temperatures within a heather stand and another above a burnt moorland surface. Wind velocities were measured above the two environments during an eight-hour period in June 1980.

Temperatures above the burnt moor were more extreme and variable, with cumulative recorded temperature changes of 733C° in one week, compared with 226C° within the heather stand. Over an annual cycle, temperatures over burnt moorland had a greater amplitude of variation. Hence, mean monthly temperature variability above the burnt site exceeded that above the heather site for ten months of the year, by up to 10C°. Freezing temperatures were more frequent above burnt moor, with an annual recorded total of 100 freeze-thaw cycles, compared with 64 within the heather stand. The total annual recorded duration of freezing temperatures at the latter site was 15 per cent less than at the former.

Wind velocities, at three heights above burnt moorland, were considerably higher than above heather moorland. At 9 cm above ground level the mean wind velocity of fifty recordings was 0.9 m sec^{-1} above the burnt moor, compared with 0.2 m sec^{-1} within the heather stand.

It is suggested that these air temperature changes promote the breaking and fragmentation of peat surfaces. Increased surface runoff volumes and wind velocities, which are a direct consequence of heather removal, will be highly efficient in transporting exposed aggregates, due to the low specific gravity of surface materials. Thus, exposed moorland surfaces are more prone to wind and water erosion.

Introduction

The rotational burning of older heather stands is an important aspect of moorland management. Such practices encourage the growth of young heather shoots, with enhanced nutritional value for grazing sheep and grouse. However, our knowledge of the environmental response to such controlled heather burning is limited. Relative differences in air temperature between heather-clad and burnt moorland are considered to affect both floral (Grace and Woolhouse, 1970) and faunal (Cragg, 1961) ecology. Heather removal also increases the likelihood of nivational processes, with their concomitant erosional effects (Radley, 1962).

Despite the theoretical importance of moorland air temperatures, few data have been forthcoming. Delany (1953) noted differences in air temperatures between heather-covered and burnt surfaces above Devon heathland over a five-day period, while Barclay-Estrup (1971) discusses weekly maxima and minima within heather stands in various growth stages on Elsick Heath, Scotland. However, relative temperature variations between the two moorland states over an annual cycle have received scant attention. Similarly, while the enhancement of surface wind velocities by heather removal has been noted (Gimingham, 1972) and is considered to affect sediment transport within both heathland and moorland environments (Stoutjesdijk, 1959; Chapman *et al*, 1975; Imeson, 1971; Fullen, 1982), quantitative evidence of such contrasts in wind velocities are sparse.

Methods

Investigations were undertaken on Egton High Moor, at a site 315 m above sea-level on the North Yorkshire Moors (Grid Ref. NZ 766017). The site was selected as it is fairly typical of the upland fire-managed moors and is near related soil erosion investigations. Vegetation cover comprised mainly heather (*Calluna vulgaris*) in the 'mature' growth-phase (Watt, 1955).

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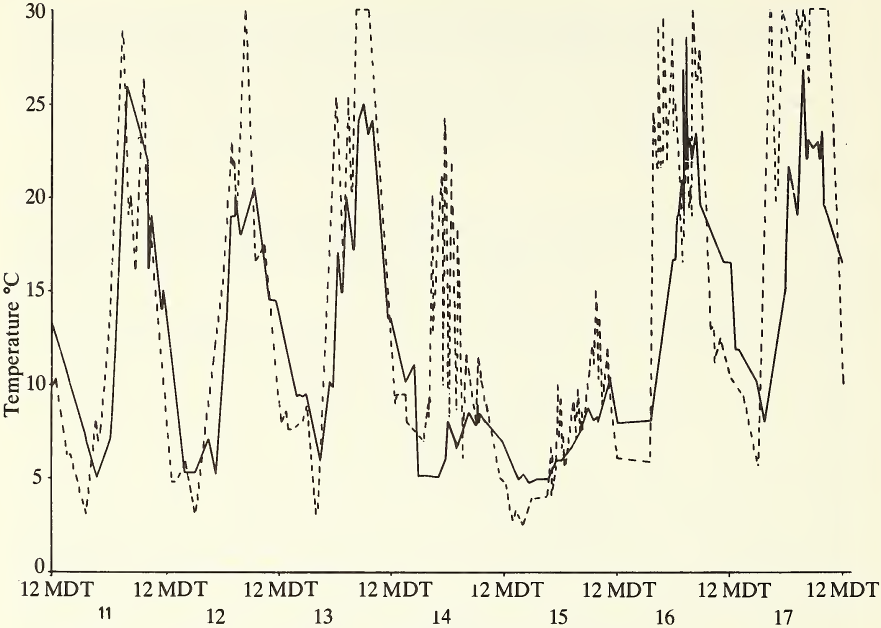


FIGURE 1

Temperatures recorded by the probes 11–17 June 1979. Temperatures recorded within the heather stand denoted by a solid line (————) and those above burnt moorland denoted by a dashed line (----).

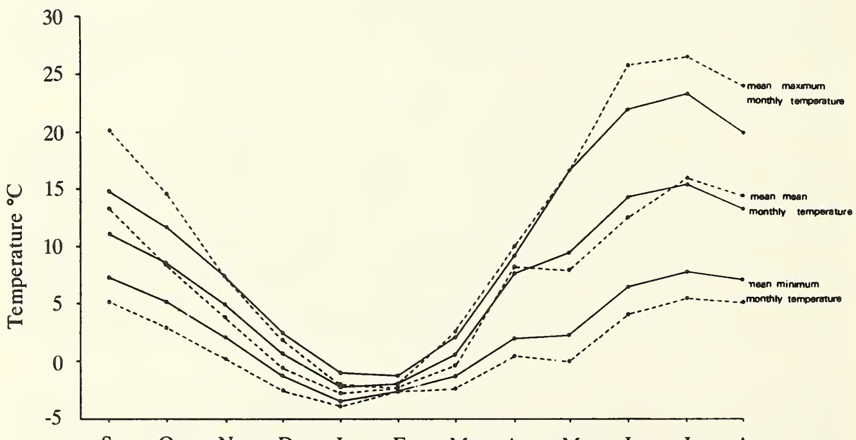


FIGURE 2

Mean monthly maxima, mean monthly minima and mean monthly mean temperatures recorded by the two probes.

Removal of all heather within eight 0.25 m^2 quadrats allowed estimates of biomass to be made. Mean air-dry above-ground biomass was 2.23 (± 0.30) kg m^2, a value comparable with dense stands in Scotland (Robertson and Davies, 1965).

A Negretti and Zambra automatic temperature recorder was installed, with one probe fixed at 2 cm above a moorland surface which had experienced controlled burning in April 1978, while the other was similarly inserted into an adjacent fifteen-year-old, 37 cm high heather stand. Both probes were covered by white plastic shielding to prevent direct insolation interfering with temperature recordings. Temperatures experienced by both probes were continuously entered onto circular twenty-eight-day charts. Periodic re-checking with laboratory calibrated equipment demonstrated accuracy to be ± 0.2C°.

The subsequent analysis is based upon data collected between 1 September 1978 and 31 August 1979, during which 348 days of data were collected. Missing data are due to severe wintry conditions preventing field access between mid-February and early March. For each probe and each day of record the maximum, minimum and mean temperatures (C°), the maximum variation in temperature (i.e. maximum minus minimum), the duration of sub-zero temperatures (hours) and the number of freeze-thaw cycles, were extracted from the charts.

Wind velocities (m sec^{-1}) at 100, 41 and 9 cm above the moorland surface were recorded next to the thermograph over an eight-hour period between 14 and 15 June 1980. Fifty profiles were measured, both above burnt moorland and within and above a 47 cm high heather stand, using three calibrated E.T.A. hot-wire anemometers.

Results

Data analysis allowed the recognition of more extreme and variable air temperatures above burnt moorland, over instantaneous, diurnal and seasonal time-scales. Instantaneous fluctuations were recorded by both probes, attributed to alternating periods of direct and diffuse insolation. These variations were superimposed upon a diurnal cycle, with maximum temperatures usually recorded in the early afternoon (1300–1500 hr) and minimum values in the early morning (0300–0500 hr). The combination of short-term and diurnal temperature fluctuations produced a complex pattern of change. For example, Fig 1 displays temperature changes recorded by both probes during the week 11 to 17 June 1979, when the sum total of all temperature changes recorded by the heather probe was 226.5C°, compared with 733.5C° above the burnt ground. Figure 1 suggests that temperature changes above the burnt ground preceded changes below the stand, agreeing with the findings of Delany (1953).

TABLE 1

Student's t values and Pearson correlation coefficients relating temperature data for burnt and unburnt stands

Temperature variable	t	r
Daily maximum temperature (C°)	−8.34***	0.95
Daily minimum temperature (C°)	17.13***	0.92
Daily mean temperature (C°)	2.12*	0.95
Daily maximum temperature variation (C°)	−14.52***	0.83
Daily duration of sub-zero temperatures (hours)	−3.74***	0.92
Daily number of freeze-thaw cycles	−4.19***	0.33

Degrees of freedom = 346.

*** Significant at <0.001 probability level.

* Significant at <0.05 probability level.

All r values significant at <0.001 probability level.

TABLE 2
Sub-zero temperatures and temperature variability for burnt and unburnt stands (C°)

Temperature variable	Stand*	S	O	N	D	J	F	M	A	M	J	J	A
Mean monthly minimum sub-zero temperature (C°)	H			−4.3	−3.1	−3.4	−2.7	−1.4	−1.0	−1.9			
	B	−1.0	−2.7	−3.1	−3.5	−3.9	−3.6	−2.7	−1.8	−3.6			
Mean monthly temperature variability (C°)	H	7.6	6.7	5.3	4.5	2.2	1.5	3.4	8.9	14.5	15.9	15.6	12.7
	B	16.1	14.4	8.6	14.5	1.9	0.3	5.2	11.8	18.9	21.9	20.3	18.9

* H = Temperature recorded within heather stand.
B = Temperature recorded above burnt moor.

TABLE 3
Wind Velocity Measurements

Height above ground (cm)	Wind Velocity ($m\,sec^{-1}$): Above heather stand		Above burnt surface		Significance of difference	
	Mean (n = 50)	S.D.	Mean (n = 50)	S.D.	t	p
100	2.8	2.8	3.4	2.5	−1.1	N.S.
41	0.4	0.3	2.1	1.9	−6.2	<0.001
9	0.2	0.3	0.9	1.1	−4.1	<0.001

FIGURE 3(a)
Number of days on which sub-zero temperatures recorded.

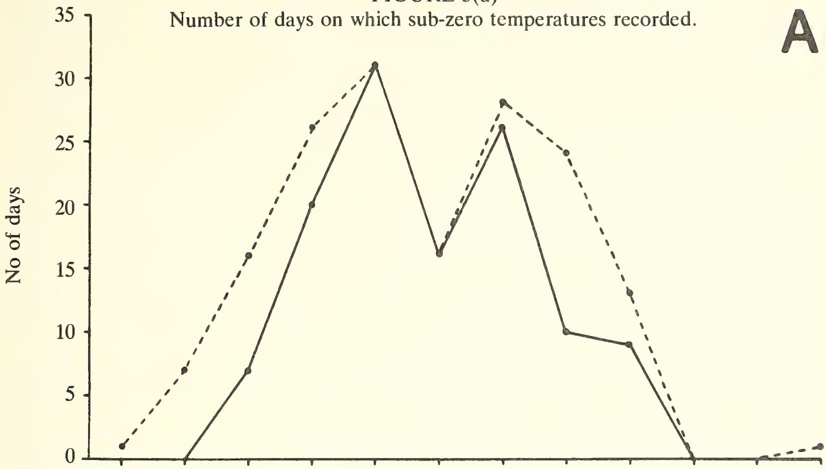
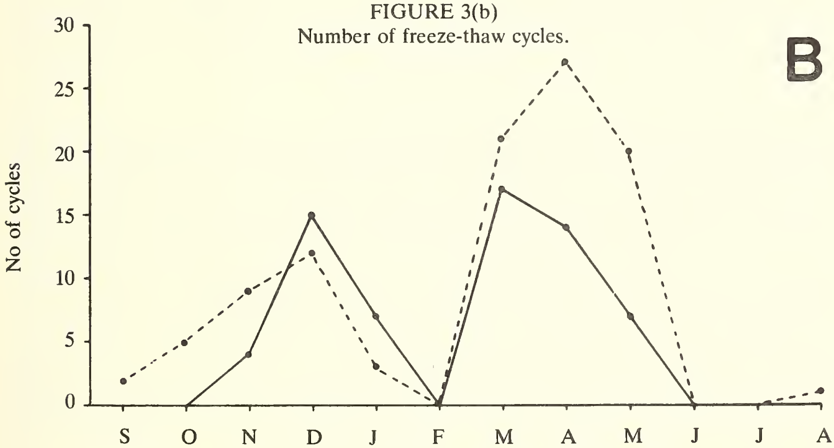


FIGURE 3(b)
Number of freeze-thaw cycles.



Analysis of variance confirms that temperatures above the two moorland sites were distinct. Student's t-values for each temperature variable indicate significant differences between the two moorland sites, but calculation of Pearson correlation coefficients demonstrates strong levels of association between the two data sets (Table 1). Thus, the different environmental milieux of the probes have created two distinct, but related, sets of data.

Aggregating the data to monthly means demonstrated greater amplitudes above the burnt moor over an annual cycle. Mean monthly maxima exceeded the heather values for eight months of the year, by up to 5C° between June and September (Fig 2). During winter the situation was reversed, with slightly higher mean temperatures below the heather stand. Conversely, burnt moorland tended to experience relatively cooler temperatures, with mean monthly minima up to 2C° lower than within the heather stand (Fig 2). Burnt moorland is considerably more susceptible to freezing temperatures. Thus, during only two months (June and July) were no freezing temperatures recorded by the burnt moorland probe, compared with five months within

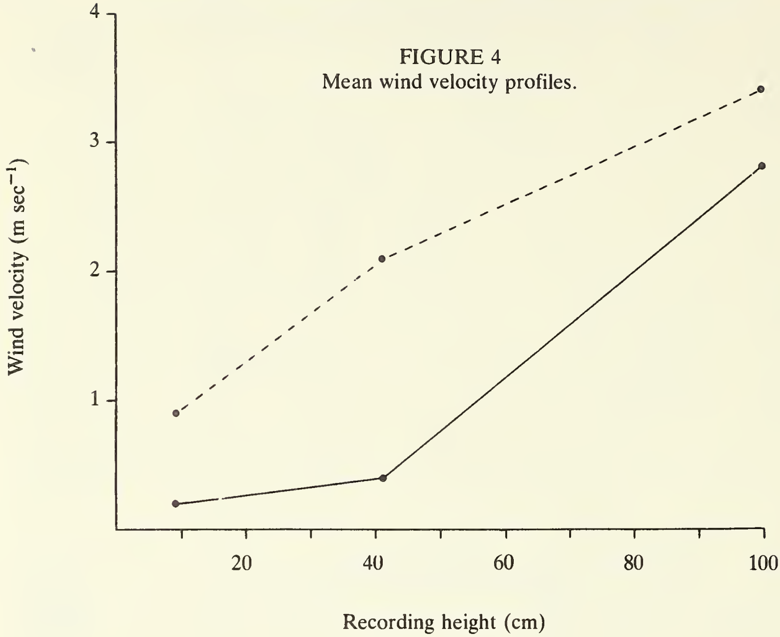


FIGURE 4
Mean wind velocity profiles.

the stand (Fig 3(a)). In total, freezing temperatures were recorded on 163 days above the burnt ground, totalling 2598.5 hours, with temperatures never rising above 0C° for 72 days of the year. In comparison, freezing temperatures were recorded on 119 days within the heather stand, totalling 2207.5 hours, with temperatures never rising above zero for 67 days. Hence, the recorded duration of freezing temperatures within the stand was 15 per cent less than over the burnt ground. In addition, burnt moorland was more prone to freeze-thaw cycles, with 100 cycles recorded over the year, 36 more than the heather probe (Fig 3(b)).

Freezes above the burnt moor tended to be more intense. With the exception of November, mean monthly minimum sub-zero temperatures were lower above the burnt moor (Table 2). The November anomaly may be explained by mild freezes over the burnt moor during early November, while above-zero temperatures were recorded by the heather probe, hence the heather mean is lower. However, during the period 25 to 30 November 1978, when both probes were experiencing sub-zero temperatures, the respective means for the heather and burnt ground probes were −4.3 and −5.5C°.

Since burnt moor had a tendency for both higher and lower air temperatures than heather moorland, temperature variability was also greater. Mean monthly variability on the former exceeded that on the latter for ten months of the year by up to 10C° (Table 2).

Heather was very effective in reducing surface wind velocities, particularly at stand level, with mean wind velocity at each recording height greater above the burnt moor (Table 3, Fig 4). Student's t-values indicate that comparative wind velocities at the two lower measuring points were significantly different. The mean wind velocity profiles (Fig 4) suggests that the presence of heather caused a zero-plane displacement in wind velocities of the order of 30 cm (Oke, 1978).

Discussion

Heather stands act as a protective buffer against temperature extremes, removal of which exposes moorland to temperatures which may promote the breaking and fragmentation of peat surfaces. Exposed moorland experiences considerably greater temperature changes. Over a

short time-scale, exposed moorland is subject to greater and more rapid oscillations in air temperatures, a phenomenon also noted on heathlands in Finland (Vaartaja, 1949) and the Netherlands (Stoutjesdijk, 1959), while over an annual cycle temperature variability is considerably greater. Such greater relative variations may promote the development of desiccation cracks.

Heather stands also tend to protect peat surfaces from freezing temperatures, thus freeze-thaw cycling was less frequent within the heather stand than above burnt moorland. Chapin *et al* (1979) have observed a similar trend, comparing freeze-thaw cycles within tussocks of *Eriophorum vaginatum* and exposed soil on Alaskan tundra. Removal of heather allows a greater number, frequency, duration and intensity of freezing events which, by initiating needle-ice formation, may promote the breaking and fragmentation of peat surfaces, as described by Radley (1962) with regard to Peak District peats.

Fragmentation of peat surfaces will make exposed aggregates highly susceptible to removal by surface water, particularly since heather removal, by diminishing interception and evapotranspiration rates, increases runoff volumes from burnt moorland (Arnett, 1979).

Exposed aggregates are also subject to removal by wind. Imeson (1971) observed removal of aggregates and plant remains from burnt ground during dry windy weather on moorland slopes within Bransdale, while Fullen (1982) has observed wind-related soil movement patterns on Sneaton High Moor, using ^{59}Fe-labelled soils. Heather removal considerably increases surface wind velocities and so facilitates greater air-borne transportation of exposed materials.

The susceptibility of exposed aggregates to removal by wind and water will be further enhanced by the lightness of surface materials, which was demonstrated by specific gravity measurements. The means of two litter and two peat samples were very low, with values of 1.05 and 1.28, respectively, compared with a mean of 2.50 for the mineral subsoil. Thus, moorland surfaces exposed by heather burning are considerably more prone to wind and water erosion.

Summary

Removal of heather stands by burning causes changes in processes acting upon the exposed surface. Temperatures tend to be relatively higher, lower and thus more variable above burnt moorland. Similarly, wind velocities tend to be relatively higher above burnt moorland. It is suggested that process-responses are evident in desiccation crack development, fragmentation of peat surfaces and enhanced wind and water erosion.

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The advice of Dr R. Arnett, of the Department of Geography, University of Hull, Dr R. Brown, of the North York Moors National Park Department and Dr A. H. Reed and Mr J. P. Smith, of the Geography Section, The Polytechnic, Wolverhampton, is gratefully acknowledged. My thanks go to the Egton Estates Company and Mr B. Nellist for their co-operation and Mr J. Hoyle for field assistance. The research was funded by the Natural Environment Research Council.

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BOOK REVIEWS

Pests, Pathogens and Vegetation edited by **J. M. Thresh**. Pp. x + 517, including numerous figures, tables and plates. Pitman. 1981. £30.

Proceedings of a joint meeting of the Association of Applied Biologists, British Ecological Society and Federation of British Plant Pathologists 15–17 April 1980.

Subtitled 'The role of weeds and wild plants in the ecology of crop pests and diseases' this is a wide-ranging volume which reflects the multidisciplinary nature of the meeting. The forty contributions are subdivided into groups of papers covering different aspects of the subject. No less than seven subject indexes are included, covering nematodes, arthropods, birds, mammals, viruses, bacteria and fungi, and plants. The volume is well laid out with numerous cross-references from one paper to another, something often lacking in published accounts of conference proceedings. Each paper has a full bibliography which serves to aquaint the reader with a wide selection of the literature available on a particular subject. With remarkably few exceptions, the numerous photographs, maps, diagrams and tables are self-explanatory and add significantly to the text. In particular, many of the tables are useful sources of information in themselves rather than the tables of undigested data so common in papers published in journals. The editor and associates are to be congratulated on putting together a coherent and polished publication in such a short time after the meeting. This volume will be of value to a wide spectrum of biologists with interests in weeds and crop pests and diseases.

JEPC

Understanding Our Atmospheric Environment by **M. Neiburger, J. C. Edinger** and **W. D. Bonner**. Pp. x + 453, with numerous b/w photographs, maps and diagrams. 2nd Edition. W. H. Freeman. 1982. $19.95.

This volume is clearly designed to be used as a textbook for a college course on meteorology. It presents a readable, accurate, scientific explanation of meteorological processes without assuming that the reader has a scientific background. Whilst a familiarity with basic mathematics is necessary, the book explains and derives any necessary equations, in both words and symbols. Moreover the equations are often used in calculations to show how they relate to atmospheric processes. The chapters cover atmospheric structure, winds, global circulation, precipitation, atmospheric humidity, weather forecasting and air pollution following a logical progression. The second edition is a slightly expanded and re-arranged version of the successful 1973 publication. One useful addition to the earlier version is a well-balanced, six-page bibliography. Overall the book provides a virtually error-free account of meteorological processes which should appeal to readers with a scientific background and allow non-scientists to develop a quantitative appreciation of weather and weather systems.

DEC

LEPIDOPTERA REPORT 1975–1980

S. M. JACKSON

Due to a combination of circumstances there have been no annual reports on Yorkshire lepidoptera in *The Naturalist* since the belated one for 1974 (Jackson, 1976) although papers dealing with changes in the distribution of butterflies in Yorkshire and adjacent counties (Jackson, 1980) and additions to the macrolepidoptera of Yorkshire (Jackson, 1982) have been published elsewhere. At one stage it was hoped to produce a single report covering the years 1975 and 1976 and after some discussion a manuscript was passed to Mr C. R. Haxby for final pre-publication preparation. Unfortunately, Mr Haxby was taken ill before he could do much work on it and sadly he died a few months later (Briggs, 1979). By the time this manuscript was retrieved, it was thought to be so far out of date that a complete review covering the years 1975–80 inclusive was the best means of clearing the back-log of records.

The object of this report, therefore, is to give a synopsis of the most significant features of the Yorkshire lepidoptera during that period, including details of only the most important records. To this end and to give a broad picture from the vast number of records received the usual systematic list and individual acknowledgements have, so far as the butterflies are concerned, been largely abandoned.

The number of lepidopterists submitting records has risen slightly during the past few years, but as usual they predominate in the south and east with very few in the less densely populated north-west where much more recording is still required.

Contributions have been most gratefully received from the following: J. S. Armitage, W. L. Barringer, H. E. Beaumont, R. L. Brook, Mrs R. Crawshaw, D. B. Cutts, R. Deaton, W. A. Ely, A. S. Ezard, D. Featherby, Mrs H. Flint, J. H. Flint, H. M. Frost, the late J. V. Gane, S. P. Garland, K. Garsed, N. Gill, A. Grieve, F. Harrison, the late C. R. Haxby, R. Hawley, R. I. Heppenstall, Dr A. M. R. Heron, C. A. Howes, J. Hunt, P. Ingham, W. Jagger, O. G. Jakes, P. Kendall, S. M. Lister, S. C. Madge, Dr B. J. MacNulty, the late Dr J. D. Pickup, T. A. Potter, P. Skidmore, B. R. Spence, R. Stevenson, F. B. Stubbs, Dr S. L. Sutton, B. Taylor, Dr P. G. Tannett, Dr M. A. Thompson, W. R. Wardell, M. C. White, P. Q. Winter, A. H. Wright.

Between 1975 and 1980 there has been a marked change in the status of many species in Yorkshire and several moths have been added to the county list. A variety of meteorological extremes during the period under review undoubtedly influenced events.

The years 1975 and 1976 were notable for their hot, dry summers which appeared to be very favourable to butterfly populations, some species being more numerous and widespread in 1976 than for many years. Moths also occurred in exceptional numbers in both these years and by 1976 were emerging two to three weeks earlier than usual throughout the summer until a cool, wet autumn brought about a reduction in numbers and more normal emergence times. In spite of this, some early spring species produced an unusual partial second generation. In comparison the years 1977 to 1980 were characterized by cool periods in spring and generally poor summers but with spells of warmer weather which brought an improvement in moth activity.

Butterflies

In the 1950s and 1960s several butterfly species showed a marked decline in many parts of Yorkshire and it has been encouraging to see some of these showing signs of recovery. Two species seem to have disappeared from the county during the period under review while those recorded during these six years and not mentioned hereunder appear to have shown no marked change in status.

The spread of *Anthocharis cardamines* (L.) (Orange Tip) in other northern counties of Britain has been very well documented (Long, 1979) and in Yorkshire there has been a similar extension of range and increase in abundance. There have always been colonies in a number of sites in the county but wandering butterflies were seen only occasionally elsewhere. Numbers began to increase in 1974 when butterflies were noted plentifully near Castleford (Jackson, 1976) and one seen at Muston near Filey (Winter, 1974) was the first recorded there for at least thirty years. In

1975 it appeared quite commonly at Muston where ova were found on hedge mustard and it has since occurred there annually although numbers have declined slightly since 1977. Around Scarborough it has become common almost everywhere and is frequently reported from gardens on the edge of the town and in surrounding villages, a marked contrast to the situation less than ten years ago when it was virtually confined to the valleys along the southern edge of the moors. In the Leeds area it was noted as common in 1978 and in south Yorkshire (where it has always been present in small numbers) it became particularly common and widespread in 1976 and appears to have maintained increased numbers thereafter.

Pyronia tithonus (L.) (Gatekeeper) was formerly widespread in Yorkshire, being recorded as far north as Redcar, commonly around Whitby and Scarborough and inland as far west as Leeds and Wakefield (Porritt, 1883). During the present century its range contracted considerably and by the 1960s it was restricted to three areas: on the coast at Kilnsea, around Market Weighton and in the Thorne and Hatfield area east of Doncaster to the Lincolnshire border (Limbert, 1975). In 1974 *P. tithonus* was found at Barlow near Selby, Rawcliffe and at Potteric Carr (Jackson, 1976). Since 1976 it has extended its range quite remarkably and by 1980 was widespread from Torne Bridge and Potteric Carr, south of Doncaster through Barnby Dun, Fishlake, Askern, Pollington, Womersley, Whitley, and Carlton to much of the area south and east of Selby with Brayton Barff as the western limit. Its range then extends north-eastwards from Selby covering Cliffe and Skipwith Commons, Foggathorpe and Market Weighton, where a colony at Thorpe-le-Street appears to be the north-western limit as none have yet been reported from the Pocklington area. Small numbers have also been seen regularly in Kiplingcotes chalk-pit, a rather dry habitat for this butterfly. There has been a westwards spread into the Rotherham area with records from Anston Stones Wood and the Chesterfield canal near Kiveton Park in 1976 and from Sandbeck in 1977. It also continues to be abundant at Kilnsea and Spurn but there have been no reports of a northward spread from there.

A less spectacular, although significant extension of range has also occurred with *Aphantopus hyperantus* (L.) (Ringlet) which has always been common in eastern Yorkshire, particularly on the limestone around Pickering, on the wolds and on the commons of Strensall, Allerthorpe and Hatfield. Although the area around Selby had been well worked for over fifty years it had not been seen within twenty miles of there until, in 1976, it occurred at Rawcliffe and has since become quite common to the south of the town. In the same period, flourishing colonies were discovered near Ripon and at two places near Leyburn and there have been records from a former site at Pilmoor near Thirsk.

There has been a continued westward spread of *Thymelicus sylvestris* (Poda) (Small Skipper). It has long occurred commonly on the Wolds, at several places on the coast, parts of the North York Moors, Skipwith and Strensall Commons and localities east of Doncaster. During the period under review it has been recorded at sites near Harrogate, Tadcaster, Wakefield, Fairburn, Huddersfield and in the Sheffield area, where it was seen more frequently than *Ochlodes venata* (Br. and Grey) (Large Skipper) in 1979 and 1980 (Garland, 1981).

The situation in the case of *Strymonidia w-album* (Knoch) (White-letter Hairstreak) is quite encouraging, particularly as it has declined in counties farther south due to the effects of Dutch elm disease. Although it was once quite widely distributed, records since the 1950s have been few and confined mainly to the Malton and Kirbymoorside areas. In 1977 larvae were beaten from wych elm in Mowbray Park, between York and Selby, and during the following three years it was noted either as larvae or imagines at Anston Stones Wood and Roche Abbey, Wentbridge, Hetchell Wood, Tadcaster, Kirkham Abbey, Oulston and Wass near Coxwold, Sleightholmdale, Sinnington, Pickering, Goathland, Sleights, Northallerton, and Hornsea Mere.

Confirmation that *Quercus quercusia* (L.) (Purple Hairstreak) is still established at Strensall Common, where it was recorded in 1959 (*Naturalist* 1967), came when larvae were beaten from oak in 1977 and 1980 and butterflies were seen in good numbers in 1979 and 1980. There have been no records from elsewhere in the county for over twenty years.

In recent years *Gonepteryx rhamni* (L.) (Brimstone) has been confined to the extreme south of the county and even there has occurred at only a low density. The hot summers of 1976 and 1977 saw a large increase in records, with many butterflies seen both in spring and autumn in the

Doncaster and Sheffield areas and there were also a number of sightings near Selby and York. Odd individuals were seen at localities a long way from any buckthorn; at Spurn on 20 April 1976, Sledmere on 21 June and Halifax on 6 August 1977. In 1978 and 1979 *G. rhamni* was again recorded only from the Doncaster area but 1980 saw a slight improvement, especially in the east with records from Rudston on 3 June and Scarborough on 30 September.

Colonies of *Pararge aegeria* (L.) (Speckled Wood) are mainly restricted to the southern end of the band of magnesian limestone which runs northwards from Maltby. It has not been seen in former localities at Gateforth, Bishops Wood and Womersley since the 1960s or from its well known station at Wentbridge since about 1970. However, it continues to occur commonly in woods near Fairburn and Micklefield and in recent years has been seen annually in Owston and adjacent woods near Askern. Elsewhere it was recorded at Thorpe Marsh in 1980 and there were isolated reports from Kiveton Park in 1978 and from the Sheffield area: Jordanthorpe in 1976, Gillfield Wood in 1977 and Wyming Brook in 1978 (Garland, 1981).

The headquarters of *Melanargi galathea* (L.) (Marbled White) in Yorkshire are on the Wolds. At its best known site at Burdale it is still common on one slope, but has disappeared from others which were enclosed a few years ago and are now heavily grazed. It continues to be common in Warrendale and at Cowlam and is present in small numbers at Thixendale. One near Sherburn on 27 July 1980 is the most northerly record for over ten years.

Colonies of *Erynnis tages* (L.) (Dingy Skipper) are most numerous in the east of the county and there have been continued sightings on the chalk and limestone at Newtondale, Ashberry Pastures, Flixton, Fordon and Rillington. In south Yorkshire it occurred at Rockley in May 1980 and at Potteric Carr in 1976 and 1980. Although there are no recent records from Barlow and Skipwith Common, butterflies have been discovered at two places in West Yorkshire: near Micklefield where it was seen in 1977 and 1979 and at Sherburn Willows in 1979 and 1980.

After occurring widely in the south and east of Yorkshire in the 1940s and 1950s *Polygonia c-album* (L.) (Comma) disappeared from the county. On 22 July 1976 one was seen by R. D. Purnell at Oakenshaw near Bradford (per C.R.H.) and one occurred at Beauchief, Sheffield in the same year (Garland, 1981). No more were reported until 1980 when, on 3 August, one visited bramble at Wadworth Wood (C.A.H.) and on 2 September one was seen on buddleia at Muston (Winter, 1980a).

The fritillaries have continued a general decline in the county, not even the summer of 1976 bringing any increase in records. *Boloria euphrosyne* (L.) (Pearl-bordered Fritillary) is in the most precarious position with nearly all recent reports coming from the Newtondale area where one or two were seen annually until 1979. However, three or four were seen in an ideal site near Kirbymoorside on 10 June 1979 (T.A.P., P.Q.W.) but no visit was made there in 1980, when there was a complete lack of records of this butterfly in the county.

The position of *Boloria selene* (D. and S.) (Small Pearl-bordered Fritillary) is a little better. In 1980 it was common at Lawkland Moss and Austwick Moss where it has occurred for many years and on 22 June 1980 an additional colony was discovered in the Pickering area, where one or two others are known to survive.

Argynnis aglaja (L.) (Dark Green Fritillary) is slightly more widespread, with recent sightings around Helmsley, Farndale, Fen Bog and Pickering. It is apparently now confined to vice-county 62 where it has decreased considerably during the past twenty years and seems to have completely disappeared from the western and southern parts of the county.

In recent years, records of *Celestrina argiolus* (L.) (Holly Blue) have been very sporadic and during the period under review it has only been seen in three widely scattered localities. One occurred at Spurn on 3 September 1976 and in 1979 one occurred at Shaw Mills near Harrogate on 13 May and two were seen in Arkengarthdale on 8 June.

In the late 1960s, at the time of the publication of the *Lepidoptera of Yorkshire*, optimism was expressed about the population of *Hipparchia semele* (L.) (Grayling) in the east of the county. Since that time it has suffered considerable decline and has all but disappeared from its former localities. In spite of annual searching around its former haunts in the Wolds, the only recent records are from Kiplingcotes chalk-pit in 1976 and from an unspecified site in 1980.

The decline of *Pyrgus malvae* (L.) (Grizzled Skipper) appears to be even more catastrophic, as none have been reported during the six years under review. It is doubtful if the known

localities of this butterfly have been regularly checked however, and it may still persist.

Among the migrant species *Colias croceus* (Geoff.) (Clouded Yellow) has been seen only twice: in Bolton Woods, Wensleydale on 17 August 1976 by R. Town (per S.M.J.) and at Spurn where several occurred on 11 August 1979 (B.R.S.).

The year 1976 was exceptional for records of *Nymphalis antiopa* (L.) (Camberwell Beauty) and this sporadic immigrant was recorded widely in Yorkshire, providing more records than any year since 1872. The first was seen at Pontefract on 15 August and was followed by at least forty reports covering much of the county until one at Spurn on 26 September provided the latest recorded appearance. Most were in the area between Sheffield, Doncaster, York and Leeds but single butterflies were seen at such scattered localities as Sleights, Runswick Bay, Scotch Corner, and Nidderdale. A comprehensive account of the 1976 invasion of the Camberwell Beauty, including details of Yorkshire occurrences, has been published elsewhere (Chalmers-Hunt, 1977).

Vanessa atalanta (L.) (Red Admiral) appeared annually although in fluctuating numbers. In 1975 it was quite scarce, with only a small number of coastal records in August and September and very few inland. In contrast, 1976 was the best year, with Spurn providing the earliest and latest records on 10 April and 7 November respectively. Between these dates it was seen in every month and occurred widely, but in spite of early arrivals most reports referred to only small numbers, even in late summer. Numbers were higher on the coast, especially at Spurn where peak counts were 150 on 5 August, 80 on 3 September and 100 on 10 October. The remaining years saw a return to relative scarcity with the majority of records coming from coastal localities; only in 1979 was there an appreciable number of inland records.

Following a few sightings near the coast in 1975, *Cynthia cardui* (L.) (Painted Lady) was much more widespread in 1976. The earliest was recorded at Bempton on 16 June with single butterflies occurring at Wass and Muston by the month end. Larvae were found at Muston in July and butterflies became more widespread from the third week of that month, but occurred in one's and two's except at Spurn where daily numbers fluctuated between ten and nineteen in early September. After 8 September only three single butterflies were seen, one on 4 October being the latest. The years 1977 to 1979 produced relatively few sightings although *C. cardui* was recorded well inland in 1977 and 1979. There was a small arrival from 5 to 7 June 1980, the first being seen near Leyburn with further records from coastal areas and around Leeds and Doncaster. The frequency of subsequent records suggests that small numbers arrived intermittently throughout the rest of June and July. During the night of 29 July there was a considerable influx, resulting in eleven being caught in an M.V. light trap at Muston (Winter, 1980b) and single butterflies were similarly captured at Rudston and Spurn. On 30 and 31 July large numbers were seen moving north-westwards across the eastern half of the county to become widely distributed. An account of nationwide observations (Bretherton and Chalmers-Hunt, 1981) shows that this was just one of several waves of *C. cardui* to invade different parts of Britain in 1980. Many remained wherever there was an adequate supply of thistles but the majority disappeared during a period of unsettled weather which began on 6 August and after the middle of the month only occasional butterflies were seen. The latest reported was near Tadcaster on 15 October. At the end of July, a few larvae were seen at Muston and in September they were abundant there. As few imagines were seen after mid-August, it is presumed that the majority of these larvae perished.

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(To be continued)

BOTANICAL REPORT FOR 1981

Flowering Plants and Ferns

The recorders wish to thank all those who have contributed to these reports. The figures indicate 10 km grid squares.

† new county record *new vice-county record

In each of the vice-county lists, names of contributors are given the first time each occurs and thereafter initials are used. In the records of casuals and adventives a key to initials is given and the vice-county numbers are shown in brackets.

East Yorkshire (VC 61) (F. E. Crackles)

Much botanical work has been done during the year in relation to the tetrad mapping scheme and this cannot be fully reflected in a report concerned only with uncommon species.

There are some outstanding records, significantly mainly for critical species or hybrids. Recently I have critically examined material collected in 1960 and which I believed to be the hybrid sedge *Carex diandra* × *C. paniculata* (= *C.* × *beckmannii*), together with specimens of the parental species from the same locality, and have confirmed its identity. The material has also been seen by specialists at the British Museum (Natural History), who earlier this year also saw this hybrid from Northern Ireland, these being the only British records. In 1980, John Spencer found the intergeneric hybrid *Festuca rubra* × *Vulpia bromoides* on a disused railway siding in Hull, this being a third British record.

A bird-watcher from Lincoln recently found *Ruppia spiralis* in a pond just to the north of Spurn, the first time this species has been found on the east coast, north of the Humber. *Erophila praecox* which is found to be widespread on Spurn is also a first Yorkshire record, whilst the Polypody which turned up in the dunes at Spurn after the storms of 1978 is *Polypodium interjectum*, a vice-county record for this species. *Salix triandra* × *S. viminalis* found by Mrs Brigham at Hemingborough is also a new East Riding record.

**Polypodium interjectum* Shivas Sand dunes, Spurn 54/41; F. E. Crackles, conf. R. H. Roberts. Previously recorded erroneously as *P. vulgare* L. (Botanical Report, 1978).

Azolla filiculoides Lam. Garden pond, Beverley 54/03, 1979; M. Nethercoat. 2nd V.C. 61 record.

†*Erophila praecox* (Stev.) DC. Spurn 54/41; F.E.C.

Montia perfoliata (Willd.) Howell Well established at Naburn Hospital 44/64; E. Bray.

Chenopodium polyspermum L. Garden weed, Heslington 44/64; E.B.

Malva neglecta Wallr. Near Fulford 44/64; E.B.

Rhamnus catharticus L. Near Fulford 44/64; E.B.

Rosa dumalis Bechst. Near Fulford 44/64; E.B., det. Dr Melderis.

Saxifraga tridactylites L. Hemingborough 44/63; D. R. Grant.

Epilobium roseum Schreb. Garden weed, Fulford 44/64; E.B.

Epilobium adenocaulon Hausskn. Near Barmby Moor 44/74; F.E.C. Snake Hall 44/83; Y.N.U. Excursion.

Oenanthe aquatica (L.) Poir. Hemingborough 44/63; Y.N.U. Bot. Sect. Excursion.

Polygonum hydropiper L. Near Hemingborough 44/62; Y.N.U. Bot. Sect. Excursion.

Rumex tenuifolius (Wallr.) Löve Snake Hall 44/83; Y.N.U. Excursion
Rumex hydrolapathum Huds. Pond near Holmpton 54/32; F.E.C.
**Salix triandra* L. × *S. viminalis* L. = *S.* × *mollissima* Hoffm. ex Elwert Hemingborough 44/63; W. Brigham, det. R. D. Meikle.
Anagallis minima (L.) E. H. L. Krause Allerthorpe Common 44/74; T. F. Medd. The only extant record and 2nd V.C. record.
Pentaglottis sempervirens (L.) Tausch Fulford 44/64; E.B.
**Veronica anagallis — aquatica* L. × *V. catenata* Pennell Sterile hybrids at Burstwick gravel pit 54/14 and near Howsham Bridge 44/76; F.E.C.
Veronica agrestis L. Near Fulford 44/64; E.B.
Bidens cernua L. Fulford Ings 44/64; E.B. Only extant record.
Anthemis arvensis L. Near Barmby Moor 44/74 and 75; F.E.C.
Potamogeton perfoliatus L. Near Firby 44/76; Y.N.U. Bot. Sect. Excursion.
†*Ruppia spiralis* L. ex Dumort. Kilnsea Beacon Lane Pond 54/41; P. Haywood, conf. F.E.C.
Zannichellia palustris L. Duck Nest 44/83; D.R.G.
Allium scorodoprasum L. Near Firby 44/76 and near Hemingborough 44/62; D.G.
Epipactis helleborine (L.) Crantz Wheldon Plantation 54/32; W. Hamilton comm. F.E.C.
Lemna gibba L. Dike near Humber bank, Welwick 54/31; E. Wear and F.E.C.
Typha angustifolia L. Near Fulford 44/64; E.B.
Carex hostiana DC. Near Firby 44/76; D.R.G.
Carex binervis Sm. Near High Catton 44/75; D. Haythornthwaite.
Carex demissa Hornem. Near Firby 44/76; D.R.G.
Carex vesicaria L. Ditch by Beverley by-pass 54/03; E. Chicken.
Carex pendula Huds. Tilmire 44/64; E.B.
Carex pallescens L. Newton Maske 44/74; F.E.C. Naburn and Fulford 44/64; E.B.
Carex pilulifera L. Near High Catton 44/75; D.H.
†*Carex diandra* Schrank × *C. paniculata* L. = *C.* × *beckmannii* Keck ex F. Schultz Near Wansford 54/05. First found 1960; F.E.C., conf. O. A Chater and R. W. David. First record for England.
Deschampsia flexuosa (L.) Trin. Near High Catton 44/75; D.H.
†*Festuca rubra* L. × *Vulpia bromoides* (L.) S. F. Gray On ballast of disused railway sidings, West Hull 54/02, 1980; J. E. Spencer, det. C. A. Stace.
Vulpia myurus (L.) C. C. Gmel. Near Fulford 44/64; E.B. Spring Head Sidings, Hull 54/02; J.E.S. and F.E.C. Near Brandesburton 54/14; J.E.S. Newton Maske, at edge of winter flooding 44/74; F.E.C.
Agrostis canina L. Duck Nest 44/83; Y.N.U. Excursion.

North-East Yorkshire (V.C. 62) (T. F. Medd)
Barbarea stricta Andrz. Heworth, York 44/65; Miss W. Brigham.
Tilia platyphyllos Scop. Sinnington 44/78 & Sleightholme Dale 44/68; R. Gulliver.
Malva moschata L. Harwood Dale 44/99; T.F.M.
Geranium sanguineum L. Tollerton 44/56; N.C.C. Railway Survey, 1977.
Vicia tetrasperma (L.) Schreb. Yarm 45/41; N.C.C. Railway Survey, 1977.
Potentilla anglica × *erecta* = *P.* × *suberecta* Zimmet. Dalby Forest 44/88; T.F.M.
Salix triandra L. R. Derwent, Norton, Malton 44/77; York and District F.N.S.
Salix caprea × *viminalis* = *S.* × *sericans* Tausch ex A. Kerner High Worsall 45/30; Mrs H. Pellant.
Pyrola media Sw. Turkey Carpet, Silpho 44/99; T.F.M.
Senecio squalidus × *viscosus* = *S.* × *londinensis* Lousley Stockton-on-the-Forest 44/65; W.B.
Gagea lutea (L.) Ker-Gawl. Stittenham 44/66; R.G. (confirmation of pre-1930 record).
Lemna polyrhiza L. Clifton, York 44/65; W.B. (confirmation of pre-1930 record).
Carex riparia Curt. Kirkham Abbey 44/76; N.C.C. Railway Survey, 1977.
Festuca pratensis × *Lolium perenne* = × *Festulolium loliaceum* (Huds.) P. Fourn. Mount Grace Priory 44/49; H.P.
Hordelymus europaeus (L.) Harz Sinnington 44/78; R.G.

South-West Yorkshire (V.C. 63) (D. R. Grant)

Phyllitis scolopendrium (L.) Newm. Near Ackworth 44/41; D. R. Grant; Cleakheaton 44/12; E. Thompson.

Asplenium ruta-muraria L. Thurstonland, Penistone 44/20; D.R.G.

Drypoteris borreri Newm. Ramsden Clough, Holmfirth 44/10; Y.N.U. Excursion.

Ophioglossum vulgatum L. Glusburn 34/94; T. Schofield.

Equisetum telmateia Ehrh. Glusburn 34/94; T.S.

E. sylvaticum L. Hanging Heaton, Dewsbury 44/22; E.T.

Ranunculus lenormandii F. W. Schultz Higher Winsley, Todmorden 34/92; T.S.

Berberis vulgaris L. Near Hampole 44/51; D.R.G.

Ceratophyllum demersum L. Park Hill, Wakefield 44/32; J. Watson; Canal at Mytholmroyd 44/02; T.S.

Rorippa sylvestris (L.) Bess. R. Aire at Cononley 34/94; D.R.G.

R. amphibia (L.) Bess. R. Calder at Ravensthorpe 44/21; E.T.

Hypericum humifusum L. Marsden, Huddersfield 44/01; T.S.

Chenopodium bonus-henricus L. Crackenedge, Dewsbury 44/22; E.T.

Montia sibirica (L.) Howell Mirfield 44/22; E.T.

Ulex gallii Planch. Applehaigh, Notton 44/31; D.R.G.

Ononis repens L. Applehaigh, Notton 44/31. D.R.G.; near Pickburn 44/50; T.S.

Medicago arabica (L.) Huds. R. Calder flood bank, Dewsbury 44/22; E.T.

Coronilla varia L. Batley Carr, Batley 44/22; E. W. Littleton.

Prunus domestica L. Stanley, Wakefield 44/32; D.R.G.

P. padus L. Gill Bridge, Cowling 34/94; Y.N.U. Bryology Excursion.

Epilobium nerterioides Cunn. Centre Vale, Todmorden 34/92; E.T.; Oxenhope 44/03; T.S.

Cornus sanguinea L. Middlestown, Wakefield 44/21; E. Lucas.

Oenanthe crocata L. Cononley 34/94; E.T.; Norbury Bridge 44/21; E.L.

Bryonia dioica Jacq. Hessle Common, Ackworth 44/41; D.R.G.

Humulus lupulus L. Applehaigh, Notton 44/31; D.R.G.;. Canal, Red Doles Bridge, Huddersfield 44/11; B. and J. Lucas.

Carpinus betulus L. Near Cawthorne 44/20; D.R.G.

Populus canescens (Ait.) Sm. Fieldhead, Wakefield 44/32; D.R.G.

P. tremula L. Ramsden Clough, Holmfirth 44/10; Y.N.U. Excursion; Fleet Lane, Oulton 44/32; D.R.G.

Salix pentandra Lothersdale 34/94; D.R.G.

Calluna vulgaris (L.) Hull Dewsbury 44/22; E.T.

Primula vulgaris Huds. Gill Bridge, Cowling 34/94; Y.N.U. Bryology Excursion.

Lathraea squamaria L. Gill Bridge, Cowling 34/94; D.R.G.

Scrophularia umbrosa Dumort. R. Aire at Cononley 34/94; Glusburn 34/94; D.R.G.

Melampyrum pratense L. Ramsden Clough, Holmfirth 44/10; Y.N.U. Excursion.

Stachys palustris L. Dewsbury 44/22; E.T.

Galium verum L. Near Royston 44/31; D.R.G.

Solidago virgaurea L. Netherton, Wakefield 44/21; E.L.

Lactuca serriola L. M62 Motorway near Pollington 44/62; D.R.G.

Hieracium vagum Jord. Applehaigh, Notton 44/31; D.R.G.

Bidens tripartitus L. Rothwell 44/32; D.R.G.

Adoxa moschatellina L. Carr Head, Glusburn 34/94; T.S.

Crepis paludosa (L.) Moench Mytholmes, Haworth 44/03; T.S.

Potamogeton natans L. Glusburn 34/94; T.S.

P. perfoliatus L. R. Aire at Cononley 34/94; D.R.G.

P. crispus L. Flanshaw Dam, Wakefield 44/32; D.R.G.

Narthecium ossifragum (L.) Huds. Yateholme, Holmfirth 44/10; B. and J. Lucas.

Juncus tenuis Willd. Old railway, Cleckheaton 44/12; E.T.

J. acutiflorus Ehrh. Goosehill, Warmfield 44/32; D.R.G.

Listera ovata (L.) R. Br. Glusburn 34/94; D.R.G.

Neottia nidus-avis (L.) Rich. Sprotborough 44/50; D. Bramley.

Dactylorchis fuchsii (Druce) Vermeul. Railway bank, Tingley 44/22; J. Grace.
Acorus calamus L. Canal, Oulton 44/32; T.S.
Scirpus lacustris L. R. Aire at Cononley 34/94; D.R.G.
S. tabernaemontani C.C. Gmel. Park Hill, Wakefield 44/32; D.R.G.
Carex pallescens L. Marsden Clough, Holmfirth 44/00; B. and J.L.
C. caryophyllea Latourr. Carr Head, Glusburn 34/94; D.R.G.
C. disticha Huds. Cottingley Bridge, Bingley 44/13; D.R.G.: Fullwood, Sheffield 44/38; Dr L. Lloyd Evans.
Poa compressa L. R. Calder bank, Dewsbury 44/22; E.T.; Old railway, Cleckheaton 44/12; D.R.G.
Helictotrichon pubescens (Huds.) Pilg. Elslack 34/94; D.R.G.
Aira caryophyllea L. Old railway, D. Pickburn 44/50; D.R.G.

Mid-West Yorkshire (V.C. 64) (J. R. Hickson)
Ceterach officinarum DC. Bridge on disused railway, Bolton Abbey 44/05; Mrs J. E. Duncan.
Clematis vitalba L. High Batts Reserve, N. Stainley 44/27; D. R. Grant and T. Schofield.
Hypericum androsaemum L. Buckhaw Brow, near Settle 34/86; D.R.G. and T.S.
H. maculatum Crantz Near Newby Cote 34/77; T.S.
H. humifusum L. Near Rathmell 34/85; D.R.G. and T.S.
Sedum telephium L. Arcow Wood, Horton-in-Ribblesdale 34/87; D.R.G. and T.S.
Apium inundatum (L.) Reichb. f. Lumley Moor Reservoir 44/27; D.R.G. and T.S.
Zannichellia palustris L. Sawley Lake, Markington 44/26 D.R.G. and T.S.
Juncus effusus L. × *J. inflexus* L. Roadside near Yockenthwaite, Buckden 34/87; Miss F. E. Crackles.
Carex hostiana DC. × *C. lepidocarpa* Tausch Roadside flush near Yockenthwaite 34/87; F.E.C.

North-West Yorkshire (V.C. 65) (T. F. Medd)
Botrychium lunaria (L.) Sw. Dent Station 34/78; A. Stoddard
Ophioglossum vulgatum L. Dent Station 34/78; A.S.
Colchicum autumnale L. Leyburn 44/19.
Listera cordata (L.) R. Br. Dentdale 34/68; A.S.
Coeloglossum viride (L.) Hartm. Dent Station 34/78; A.S.
Gymnadenia conopsea (L.) R. Br. Crakehall 44/28; N.C.C. Railway Survey, 1977.
Pseudorchis albida (L.) A. and D. Love Dentdale 34/68 and 34/78; A.S. (both confirmations of pre-1930 records).

Casuals and Adventives (E. Chicken)
During 1981 a total of 244 records for 152 taxa were received from twelve contributors. Listed here are seventy-eight taxa, mostly those not mapped in *The Atlas of the British Flora*. Also not listed are *Polygonum cuspidatum* fourteen records, *Cicerbita macrophylla* seven and *Heracleum mantegazzianum* four records. A long list of 124 records was sent in by Mr J. Martin of plants found growing in the Wakefield area in fields treated with wool shoddy and seen by Mr E. J. Clement and Mr T. B. Ryves.

The following initials have been used:

E.J.C.	Mr E. J. Clement
F.E.C.	Miss F. E. Crackles
D.R.G.	Mr D. R. Grant
F.H.	Mrs F. Houseman
J.L.	Mrs J. Lucas
J.M.	Mr J. Martin
T.F.M.	Mr T. F. Medd

Eschscholtzia californica Cham. (64) Roadside at Farnham 44/35; F.H.
Brassica juncea (L.) Czern. (63) East Ardsley 44/22; J.M.
Brassica tournefortii Gouan (63) East Ardsley 44/22; J.M.
Hirschfeldia incana (L.) Lagrèze-Fossat (63) East Ardsley 44/22; J.M.

Lepidium densiflorum Schrad. (63) East Ardsley 44/22; J.M.
Lepidium ruderale L. (62) York 44/55; Miss W. Brigham.
Sisymbrium irio L. (63) East Ardsley 44/22; J.M.
Camelina sativa (L.) Crantz (64) Tip at Lingerfield near Farnham 44/35; F.H.
Lunaria annua L. (63) Tip at Huddersfield 44/11; J.L.
Amaranthus hybridus L. (63) Newton Hall and Rothwell 44/32; J.M.
Chenopodium pratericola Rydb. (63) East Ardsley 44/22; J.M.
Chenopodium botrys L. (63) Newton Hall 44/32; J.M.
Atriplex heterosperma Bunge (63) Newton Hall 44/32; J.M.
Atriplex nitens Schkuhr (63) Newton Hall 44/32; J.M.
Salsola pestifer A. Nels. (63) East Ardsley 44/22; J.M.
Kochia scoparia (L.) Schrader (63) East Ardsley 44/22; J.M.
Malva pusilla Sm. (63) East Ardsley 44/22; J.M.
Geranium psilostemon Ledeb. (65) Woodland by river, East Tanfield 44/27; F.H.
Erodium botrys (Cav.) Bertol. (63) East Ardsley 44/22 and Newton Hall and Rothwell 44/32; J.M.
Impatiens parviflora DC. (64) West Bank Park, York 44/55; R. Gulliver.
Vitis vinifera L. (63) Stanley near Wakefield 44/32; D.R.G.
Medicago praecox DC. (63) Rothwell 44/32; J.M.
Medicago laciniata (L.) Mill. (63) East Ardsley 44/22; J.M.
Lathyrus hirsutus L. (61) Queen Elizabeth Dock Reserve, Hull 54/12; F.E.C., 1980, conf. E.J.C.
Trigonella incisa Benth. (63) East Ardsley 44/22; J.M.
Poterium polygamum Waldst, and Kit. (61) Old railway line, Swine 54/13; F.E.C.
Sorbus intermedia (Ehrh.) Pers. (63) Woodland at Huddersfield 44/10; J.L.
Sedum spurium Bieb. (64) Riverbank at Kettlewell 34/97; F.H.
Ribes sanguineum Pursh (63) Canal Bank, Huddersfield 44/11; J.L.
Epilobium pedunculare A. Cunn. (62) Staindale Forest 44/89; T.F.M.
Ammi majus L. (63) East Ardsley 44/22; J.M.
Rumex brownii Campd. (63) East Ardsley 44/22; J.M.
Ficus carica L. (63) Canal lock wall, Ravensthorpe 44/21; D.R.G.
Amsinckia intermedia Fischer and C. A. Meyer (61) Barmby Moor 44/74; D.R.G.
Lappula marginata (Bieb.) Gürke (63) East Ardsley 44/22; J.M.
Lappula myosotis Moench (63) East Ardsley 44/22; J.M.
Echium plantagineum L. (63) East Ardsley 44/22; J.M.
Calystegia dahurica (Herbert) G. Don (62) Roadside near Pickering 44/78; F.H. and (63) Huddersfield 44/12; J.L.
Solanum sarrachoides Sendtner (63) Newton Hall 44/32; J.M.
Lysimachia punctata L. Thruscross Reservoir 44/15; L. Magee.
Erinus alpinus L. On the walls of Closes Hall, Bolton-by-Bowland 34/85; D.R.G. and T.S.
Misopates calycinum Rothm. (61) High Street, Hull 54/12; F.E.C. 1979. conf. E.J.C.
Mimulus luteus L. (62) Reservoir, Staindale Forest 44/89; T.F.M.
Salvia reflexa Hornem. (61) High Street, Hull 54/12; F.E.C. 1980, conf. E.J.C.
Bidens bipinnata L. (63) East Ardsley 44/22; J.M.
Bidens pilosa L. (63) East Ardsley 44/22; J.M.
Helianthus annuus L. (61) High Street, Hull 54/12; F.E.C., (63). Huddersfield 44/11; B. Lucas and (64) Knotford Hook, Otley 44/24; F.H.
Xanthium strumarium L. (agg.) (63) East Ardsley 44/22; J.M.
Xanthium spinosum L. (63) East Ardsley 44/22; J.M.
Tagetes minuta L. (63) East Ardsley 44/22; J.M.
Calendula officinalis L. (64) Tip at Lingerfield, Farnham 44/35; F.H.
Arctotheca calendula (L.) Levyns (63) East Ardsley 44/22; J.M.
Solidago canadensis L. (63) Huddersfield 44/11; J.L.
Solidago graminifolia (L.) Salisb. Established on King George Dock reserve 44/12, known since 1978; F.E.C.

Aster novi-belgii L. (63) Huddersfield 44/11; J.L.

Chrysanthemum maximum Ramond (63) Huddersfield 44/11 and 44/12; J.L. (Tip at Lingerfield, Farnham 44/35; F.H.

Artemisia annua L. (63) East Ardsley 44/22; J.M.

Centaurea montana L. (61) Roadside, Little Weighton 44/93; A. J. Horne.

Centaurea diluta Aiton (61) High Street, Hull 54/12; F.E.C. 1979, conf. E.J.C.

Carthamus tinctoria L. (61) High Street, Hull 54/12; E. Chicken (63) Tip at Huddersfield 44/11; J.L.

Lolium rigidum Gaudin (61) High Street, Hull 54/12; F.E.C. conf. E.J.C., (63) East Ardsley 44/22 and Newton Hall 44/32; J.M.

Poa chaixii Vill. (63) East Ardsley 44/22; J.M.

Bromus rubens L. (63) East Ardsley 44/22 and Newton Hall 44/32; J.M.

Triticum durum Desf. (64) Knotford Hook, Otley 44/24; F.H.

Hordeum hystrix Roth (63) East Ardsley 44/22 and Rothwell 44/32; J.M.

Hordeum glaucum Steudel (63) East Ardsley 44/22; J.M.

Hordeum leporinum Link (63) East Ardsley 44/22; J.M.

Avena barbata Pott ex Link in Schrader (63) East Ardsley 44/22 J.M.

Avena brevis Roth (63) East Ardsley 44/22; J.M.

Phalaris minor Retz. (63) East Ardsley 44/22; J.M.

Phalaris paradoxa L. (63) East Ardsley 44/22; J.M.

Phalaris tuberosa L. (63) East Ardsley 44/22; J.M.

Schismus barbatus (L.) Thell. (63) East Ardsley 44/22; J.M.

Eragrostis barrelieri Daveau (63) East Ardsley 44/22; J.M.

Chloris virgata Sw. (63) East Ardsley 44/22; J.M.

Panicum miliaceum L. (61) High Street, Hull 54/12; E. Chicken, (64) Knotford Hook, Otley 44/24; F.H.

Echinochloa utilis Uhwi and Yabuno (61) High Street, Hull 54/12 F.E.C. conf. E.J.C.

Digitaria sanguinalis (L.) Scop. (61) High Street, Hull 54/12; F.E.C. 1979. (63) East Ardsley 44/22; J.M.

Setaria verticillata (L.) Beauv. (63) East Ardsley 44/22; J.M.

Pennisetum clandestinum Hochst. ex Chiov. (63) East Ardsley 44/22; J.M.

Cenchrus pauciflorus Benth. (63) East Ardsley 44/22; J.M.

BOOK REVIEWS

Ecology of Desert Organisms by **G. N. Louw** and **M. K. Seely**. Pp. 194, including numerous line drawings and b/w plates and 4 colour plates. Longman. 1982. £8.50 paperback.

This is a clearly written text which covers the main areas of desert ecology. It is aimed at undergraduates with some ecological knowledge, a role which it fulfills well, since basic terms are not sufficiently well explained for the novice ecologist and the ground covered is too wide for treatment to be detailed enough for the specialist in desert ecology. Traditional ecological principles, as well as physiological, autecological and geographical aspects are considered and the extreme sensitivity of the desert environment to even minute disturbances illustrates general ecological principles well.

This is an extensive bibliography and wide use of literature, to the extent that one occasionally has the feeling that data is included for its intrinsic value rather than in response to a need to illustrate an argument. A little more guidance and comment from the authors, treating a few examples in more depth, with less cursory reference to the work of others (sometimes of dubious relevance to the desert environment) would have made some sections, e.g. Chapter 8, more interesting and readable.

Most of the book is interesting and sometimes humorous. The publishers have made good use of space and the diagrams are clear, often helping to explain the text rather than just presenting the data. The authors have struck a good balance between plant, animal and human ecology, with reference to historical, economic and cultural aspects throughout.

ARC

Venomous Creatures of Australia. A Field Guide with Notes on First Aid by **Struan K. Sutherland**. Pp. 128 (including numerous photographs, mainly coloured, maps, and several line drawings). Melbourne, Oxford University Press. 1981. $A9.95 paperback.

This field guide is not intended as a comprehensive coverage of Australian venomous creatures and naturally excludes Australian animals which are poisonous to humans when eaten. Introductory notes on first aid for bites and stings are followed by seven broad groupings of particular venomous land and sea creatures of Australia, namely snakes, insects, spiders and ticks, other land creatures, such as the platypus (*Ornithorhynchus anatinus*), jellyfish and octopus, stinging fish, and other sea creatures, including cone shells. Each of the sixty entries endeavours to give information on identification, habitat, potential danger, venom, first aid, distribution map and photograph.

The colour photographs provide the contrast necessary as a valuable aid in identification. The black and white photographs fall short in this regard. There is an index, and page headed 'Further Reading' which excludes references on insects. (A useful reference which could have been listed is Koch, L. E. *The Red-back spider and other venomous creatures*. Perth, Western Australian Museum, 1980, which apart from discussing spiders includes insects.)

Struan Sutherland's field guide to venomous creatures is an attractive publication and no doubt will be the companion of many a nature lover of Australia who knows to respect and to be prepared for the unexpected in Australian waters and bush.

DMcC

The Life of the Meadow Brown by **W. H. Dowdeswell**. Pp. viii + 165 (including 29 b/w photographs and numerous diagrams, graphs and maps). Heinemann. 1981. £5.95.

This is not a book about the life of the Meadow Brown Butterfly, despite its title, but describes a series of investigations into ecological genetics for which the Meadow Brown is a convenient subject because it is easy to find, easy to identify and easy to study. It is a semi-popular account of the work of Professors Ford, Dowdeswell and McWhirter with Dr Creed which has been published in the entomological and scientific press over four decades. They found that a statistical study of the spots on the butterflies' hind wings gave a good indication of the variation within a population, and the bulk of the book describes several investigations into this variation. The author's work on the Isles of Scilly is probably best known, where he has studied the variation of populations of Meadow Browns isolated on small islands. At the end of this book Professor Dowdeswell describes various studies to assess the significance of variation in spotting as well as a number of studies which are in progress and are providing more questions than answers. This is an enjoyable book for the entomologist with a scientific interest in insects, and illustrates the sort of work which can yield exciting and unexpected results without the need for expensive equipment or facilities.

WAE

A Key to the Families of British Diptera by **D. M. Unwin**. Field Studies 5. Pp. 513–553. 1981. Also published as a separate booklet. Field Studies Council. £1.20.

Keys for identifying families of insects, and other large groups of animals and plants are often notoriously difficult and provide a real hurdle to the novice. This is because some of the 'natural' characters separating families are difficult to see or to be certain about when one is inexperienced. Experts seldom need them for they can usually recognize a family or genus at sight, and thus bypass the awkward couplets where one may go widely astray. It is therefore most refreshing to see this key to Diptera designed for use by the non-expert, such as the ecologist or amateur entomologist.

Three techniques have been used in writing this key, the approach and results being tested and refined through the Field Studies Council AIDGAP Project. First, the couplets are all short and simple with seldom more than a single character to examine at a time. Secondly, each character is illustrated next to the couplet and an explanatory sentence included wherever a new technical term is introduced, e.g. squamae, vibrissae, closed cell. Thirdly, whenever a character is variable or difficult to see, the family keys out at two or even three places, e.g. Dolichopodidae.

The reference to many well known groups like midges, horse-flies and bluebottles, and the brief family descriptions will often help to confirm one's progress and final identification. However, problems will still arise because the specimen in front on one will seldom resemble precisely the limited diagrammatic illustrations given, particularly where wing venation is concerned. Thus it is difficult to be sure that a *Hydrobaenus* wing with six to eight well developed veins does not have vein four forked and is more like those shown for the Chironomidae than for the Ceratopogonidae. Similarly the wing of a female *Lonchoptera* differs noticeably from that of the male (figured). In these and many other instances, the illustrations in Oldroyd's key in the Royal Entomological Society's series of Handbooks, and in Colyer and Hammond's *Flies of the British Isles*, will help to dispel one's doubts.

At £1.20 this booklet is a must for all ecologists and entomologists (and libraries) who are interested in Diptera. Let us now see a similar key to the families of British spiders.

BNKD

The Family Water Naturalist by **Heather Angel** and **Pat Wolseley**. Pp. 192, lavishly illustrated with line drawings, and coloured and monochrome plates. Michael Joseph. 1982. £9.95.
The subtitle of this work 'A practical expedition to the world of ponds, rivers and the sea shore' says it all, for this work provides a wealth of information on still and running freshwaters, estuaries, sand and rocky shores, and the open sea. Basic habitat information is supplemented by notes on equipment for observing, collecting and recording. Major faunal and floral studies for each habitat and details of the key ecological factors operating there are provided, and suggested projects are given in each case. Other sections on man's impact, conservation and management, photography, where to go, societies to join, glossary, bibliography and index complete the encyclopedic treatment — all this, and of course the superb photography of Heather Angel.

RSPCA Book of British Mammals edited by **C. L. Boyle**. Pp. 242, including numerous line drawings and 16 colour plates. Collins. 1981. £8.95.
This is an account of the natural history of British mammals. Each species or group of species is dealt with by an expert on these animals. It does considerable credit to the editor C. L. Boyle that he was able to recruit a team of authors of such authority. Within each account there is a sub-division, not entirely uniform throughout, of headings such as distribution, breeding, habitat, behaviour, enemies, food, relations with man. The book is a fund of up-to-date knowledge. It is not the sort of account that can easily be read from cover to cover but is rather a comprehensive reference work on our British species. It is well illustrated with attractive line drawings and colour plates. The latter are of uneven merit with the setting in which the yellow-necked mouse finds itself somewhat resembling a surrealist nightmare! The mammals are not a difficult group to identify although the layman can have problems with some of the smaller ones, e.g. rodents, bats. Possibly a little more expansion here would have been helpful. While the specific names of the white-toothed shrews (*Crocidura*) appear in the index they are not mentioned in the text. All in all this is a useful, well written informative account.

MJD

Popular Encyclopedia of Plants edited by **Vernon H. Heywood** and **Stuart R. Chant**. Pp. 368, fully illustrated. Cambridge University Press. 1982. £15.
A fairly comprehensive reference work containing 2200 entries interspersed with two types of longer article introducing on the one hand economically important plants and products and on the other reviews of major plant groups. The text is lavishly illustrated by coloured photographs and artwork, most of which are of a high standard but a few, particularly of cryptogams, are uninformative (e.g. ferns p. 47 and moss p. 228); misleadingly coloured (e.g algae p. 64); incorrect (e.g. *Parmelia* is not a crust-forming lichen, p. 254); misnamed (e.g. lichen illustrated on p. 336 is *Hypogymnia physodes* and not *Usnea* which is completely different); misspelt (e.g. *Ramalina* not *Ramelina*, p. 199); or the scale wrongly given (e.g. pp. 199, 254, 336). It would appear from this that the lower plants have received less satisfactory treatment than the higher plants.

The title of the book is misleading since in fact the main emphasis is on plants used by man. The gardener, for example, would be disappointed in that many 'popular' house and garden

plants are not included, and even among the economic plants there are surprising omissions. On the whole, however, a good selection of the most important genera and the more interesting botanical curiosities have been included, but the coverage is not encyclopedic since the often brief information would require supplementation from other reference sources, especially where details of ecology and cultivation are concerned.

Despite these reservations, the book is handsomely produced and is straightforward to use provided the index and glossary are consulted (although even this has its pitfalls — cf. Lyme-grass). It should prove a useful reference work at a popular level, particularly in schools and local libraries.

MRDS

The Lookers-Out of Worcestershire by **Mary Munslow Jones**. Pp. 216, with illustrations by Dina Cockerill and Malcolm Stokes. The Worcestershire Naturalists' Club. £5.50.

Edwin Lees was a printer by trade and a naturalist by inclination. He was honorary curator of the Worcestershire Natural History Society's museum from its foundation in 1833 until it moved into a specially designed building (now demolished) with a paid curator in 1836. He was successful in his business, and was able to retire early and devote all his time to his natural history studies. In 1842 he published *The Botanical Looker Out* which was popular enough to call for a second edition ten years later. The title was chosen because the book originated from a series of articles published in a magazine called *The Cheltenham Looker On*. In 1847, together with two friends, he founded the Worcester Naturalists' Club, one of the oldest natural history societies in the country, and which is still extant. This book is a memoir of Lees and of the first hundred years of the Club. It is pleasingly written, and has some attractive line drawings as illustrations. The first part, which is concerned with Lees, is interesting, but after his death (in 1887) the story inevitably becomes more diffuse and less compelling. It is remarkable though that Carleton Rea, an outstanding figure in the Club, first met Lees in 1876 and died only a year before the centenary (with which the book ends) in 1947.

FHB

The Flowering Plants and Ferns of Anglesey by **R. H. Roberts**. Pp. 88. National Museum of Wales. 1982. £3.50.

Anglesey has never had a published flora of its own, so this competently written slim volume is very welcome. The plants of Anglesey were included in the *Flora of Anglesey and Caernarvonshire* (1895) by J. E. Griffith, and there are records for the county in *Welsh Flowering Plants* (1957) by H. A. Hyde and A. E. Wade. The species mentioned in these books are included in the present list, which is mainly based on observations made by the author over a quarter of a century supplemented by information provided by officers of the Nature Conservancy Council. There is a brief introduction which discusses the climate, complex geology and types of habitat in Anglesey, and mentions the contributions of the rather few botanists who have studied the flora of the county since the visits by Thomas Johnson in 1639 and John Ray in 1662. Unfortunately there is no map and grid references are not given, so it is useful to have a gazetteer and ordnance survey map to hand when using the book.

FHB

A Review of the Cornish Flora 1980 by **L. J. Margetts** and **R. W. David**. Pp. 338, with a map and 16 black and white photographs. Institute of Cornish Studies. 1981. £10 (£11.50 including postage from: Trevenson House, Pool, Redruth, Cornwall TR15 3RE).

The flora of Cornwall as it was sixty years ago is very well described in the *Flora or Cornwall* by F. Hamilton Davey (1909) and *A Supplement to F. Hamilton Davey's Flora of Cornwall* by E. Thurston and C. C. Vigurs (1922). *A Review of the Cornish Flora 1980*, which in fact refers to these works as a standard, is a worthy successor to them. The authors have an excellent first-hand knowledge of their subject, and have in addition thoroughly searched the literature and the major herbaria and called upon the assistance of some 200 individual recorders who are acknowledged in the introduction. Consequently their book is very detailed and interesting. It is heartening to learn that few species have been lost over the past half century; on the other hand,

some once rare species have become more common, and there are a number of additions to the flora. These changes are discussed in the introduction, which also describes briefly the main habitats in the county and gives typical plant lists for them. Unfortunately the reproduction of the photographs accompanying these descriptions leaves something to be desired, and the map of Cornwall is rather inadequate.

FHB

Flora Europaea Check-List and Chromosome Index by **D. M. Moore**. Pp. x + 423. Cambridge University Press. 1982. £30.

The five volumes of *Flora Europaea* contain descriptions of about 13,900 species and subspecies. In this check list the sequence of families, genera and species follows that in the main work and anyone who often has occasion to consult the Flora will find this Companion volume a very convenient summary. It also provides the literature references to the chromosome information cited in the main work, and the chromosome index will be an invaluable guide for all whose systematic work involves chromosome studies.

WAS

The Trees of Britain and Northern Europe by **Alan Mitchell**, with illustrations by **John Wilkinson**. Pp. 288. Collins. 1982. £6.95 hardback, £3.95 paperback.

This guide is well and profusely illustrated (over 1500 in colour), even to the small leaf pictures for guidance in the table of contents. After a useful introduction and keys to conifers and broadleafed trees, follow 232 pages of descriptions and illustrations of species in scientific order, native and introduced, likely to be encountered north of the Mediterranean. All the parts of each species are depicted and the whole tree shown for representative species; in a further section are black and white drawings of broadleafed trees in winter. The descriptions are clear and concise, with a brief explanation of the scientific names where applicable. A pleasing section gives the locations in Britain of fine specimens of notable trees and there is a list of places where good trees may be found. As a bonus, the inside back cover is used for descriptions of methods of measuring the height of a tree.

This is a likeable book, useful for identification and packed with interesting information — a good companion to take on holiday and other expeditions.

JED

A Field Guide to the Wild Flowers of Britain and Europe by **Thomas Schauer** illustrated by Claus Caspari. Pp. 464, with 199 coloured plates. Collins. 1982. £7.95 hardback, £4.95 paperback.

This book is a translation from a work first published in Germany in 1978. Each plate depicts from 4 to 8 species with brief descriptions on the facing page. The distinguishing features of related species are often given after the descriptions of the ones illustrated, so that the book covers in all about 1600 species, 1200 of which are illustrated. The accuracy of colour reproduction has made such progress in recent years that the best coloured illustrations of flowers are nowadays well nigh faultless. Most of the flowers illustrated in this book are so beautifully and realistically portrayed that it is all the more surprising that an occasional failure, such as the Bog Asphodel on plate 99, should have been included. On plate 8 four of the species are wrongly named through incorrect numbering.

The arrangement of the species is based on habitat; maritime, woodland, marsh and water plants, etc., being grouped together. An original type of key is provided in the introduction. The importance of conservation is stressed but the citations of protected species in the text one can only describe as bizarre. Can it be true that *Schoenus nigricans* and *Carex pulicaris* are protected species but no such safeguard extends to *S. ferringineus* or *C. pseudocyperus*?! Is Crowberry really a protected species but Milk Parsley not; and are we forbidden to gather Early Purple Orchid but free to make off with both Tway blades and even with *Calypso bulbosa*?! But it is primarily on the quality of its colour plates that the success of this book will depend and for these, save as qualified above, I have nothing but praise.

WAS

An Introduction to Plant Taxonomy by **C. Jeffrey**. Pp. x + 154, illustrated. Cambridge University Press. 1982. £12.50 hardback, £5.95 paperback.
Second edition of a book which explains in simple terms how plants are classified and named. The fundamentals, process and systems of classification, the taxonomic hierarchy, and the scientific and practical naming of plants are covered, and useful appendices, including a book-list, are also provided. Of value to the sixth-former, student and teacher, as well as gardeners, horticulturalists and naturalists.

Hilbre: The Cheshire Island, its history and natural history, edited by **J. D. Craggs**. Pp. xx + 306, including 31 b/w plates and 163 figures in the text. Liverpool University Press. 1982. £20.
A splendidly-produced book, with nineteen chapters on the recent history (especially the impact of man), ecology, flora and fauna of these small islands situated one mile from the NW corner of the Wirral Peninsula. Species lists accompanied by ecological notes and a bibliography are provided for a variety of organisms (algae, mosses, vascular plants, land and marine invertebrates, fishes, birds and terrestrial and marine mammals), but the emphasis is mainly zoological.

The Lost Villages of Britain by **Richard Muir**. Pp. 285 (including numerous b/w plates and line drawings), plus 16 pages of full colour plates. Michael Joseph. 1982. £11.95.
This is not a gazetteer, but a synthesis of the 'different forces which caused villages to be deserted', exemplified by carefuly chosen villages, beautifully and evocatively illustrated, throughout Britain and Ireland, with many chosen from Yorkshire. Recommended not only to archaeologists and conservationists, but also to a wider readership.

Environmental Archaeology by **Myra Shackley**. Pp. xvi + 213, numerous photographs, line drawings, tables and graphs. Allen & Unwin. 1981. £18 hardback, £9.95 paperback.
Environmental archaeology is a rapidly expanding subject area with as yet very little adequately organized supporting literature. This book, therefore, supplies a long-felt need, particularly by undergraduates. A concise, but eminently readable text is ably supported by well-chosen illustrations, and a most helpful bibliography surveying the very disparate literature sources follows each chapter. Useful appendices (including glossary) and author and subject indexes are also provided. Highly recommended, being suitable not only for the serious student but also providing an approachable introduction for the general reader.

MRDS

Heavy Metals in Northern England: Environmental and Biological Aspects edited by **P. J. Say** and **B. A. Whitton**. Pp. x + 198, illustrated. University of Durham. 1981. £4 (including postage) from Department of Botany, University of Durham, Durham DH1 3LE.
Proceedings of a conference on Heavy Metals and the Environment held at the University of Durham, 17–18 October 1981: eighteen papers on such aspects as the geology, mining, ecology, pollution and analyses of heavy metals in aquatic and terrestrial habitats.

Winter Skills by **Rob Hunter**. Pp. 246, including numerous line drawings and b/w plates. Constable. 1982. £5.95.
An excellent little book covering many aspects of outdoor activity and survival, especially in winter. Chapters cover such topics as weather, clothing, equipment, shelter and first aid. There are not only clear descriptions of equipment such as ice axes but also advice as to how to use them to best effect. The author explains how to avoid outdoor hazards in winter, emphasising the need for careful planning but he also advises what to do should things go wrong. A very useful book full of information, which would make an ideal present for the outdoor enthusiast.

JEPC

LETTER TO THE EDITOR

THE TWO CANON FOWLERS

Dear Sir,

In Dr Roy Watling's interesting paper in the last issue of *The Naturalist* wherein is recounted the important role played by Yorkshire mycologists in the origin of the British Mycological Society, there are several references to the Rev W. Weekes Fowler. The person intended however was the Rev William Fowler, for W. W. Fowler was a Coleopterist who had no connections with Yorkshire. It is not surprising that two naturalists whose professions were identical, who were both appointed Canons and whose names were so closely alike, should have been confused.

Canon William Fowler (1835–1912) was a Lincolnshire man who, after graduation at Cambridge, came to Yorkshire and served as curate at St Johns, Cleckheaton, for five years before becoming Vicar of Liversedge, where he remained until his retirement in 1910. He thus spent all his working life in Yorkshire and his wide botanical interests — which covered algae, fungi and flowering plants — drew him into active participation in the natural history activities of his adopted county. He was President of the old West Riding Consolidated Naturalists' Society at the time (1876–77) when it enlarged its scope and changed its title to become the Yorkshire Naturalists' Union. He was thus the first President of the YNU and he was re-elected to the Chair in 1901.

Canon William Weekes Fowler (1849–1923) was a Gloucestershire man who, after graduation at Oxford, was ordained in 1873 and was a master at Repton School before becoming Headmaster of Lincoln Grammar School, a post which he held for more than twenty years. After relinquishing his school work, he served for the rest of his life as a priest in parishes in Oxfordshire and Berkshire. As a naturalist, W. W. Fowler is best known for his five-volume work on the Coleoptera of the British Isles (1886–1890) which was for many years the standard work on British beetles. He was not related to the other Canon Fowler and had no known associations with Yorkshire. Each of the Fowlers was created a Canon within bishoprics of their adopted counties: W.W.F. was a Canon of Lincoln Cathedral whilst W.F. was a Canon of Wakefield. It so happened also that the two Fowlers followed one another as third and fourth Presidents of the Lincolnshire Naturalists' Union in 1897 and 1898.

In 1955 Miss E. M. Blackwell was Chairman of the Mycological Section of the YNU. The autumn foray that year was held at Pateley Bridge. I recall vividly Miss Blackwell's delightfully racy and informative address on 'Links with past Yorkshire mycologists'. This was printed six years later in an amplified form in *The Naturalist* (1961: 53–66). In it the Rev W. Fowler is referred to as William Weekes Fowler. As editor of our journal at that time I must accept some responsibility for not detecting and correcting the error. When, too late, I drew Miss Blackwell's attention to the matter, she cited in her defence Rendle's edition of the *Biographical Index of British and Irish Botanists* (1931) wherein the same error is made. In Miss Blackwell's next paper which followed in the same volume of *The Naturalist* (1961: 163–168) the Rev William Fowler is correctly cited throughout and in the recent (1977) third edition of the *Biographical Index of British and Irish Botanists* edited by R. Desmond the mistake in the second edition has also been corrected.

Yours faithfully

W. A. Sledge
Department of Plant Sciences, University of Leeds

CORRECTION

It is with regret that I overlooked an error at the proof stage in my recent paper, 'The phytophagous insect fauna of *Mercurialis perennis* L.' (*Naturalist* **107**: 141–150). Lines 11 and 12 on page 148 should read '. . . greater than the estimate cited above and tends to contradict views expressed by Wilson (1968) suggesting that the plant has a somewhat impoverished fauna. The plant is obviously not too toxic for invertebrate exploitation even though it contains the . . .'.

Richard G. Jefferson

DR WILFRED TAYLOR MEMORIAL APPEAL

Soon after Dr Wilfred Taylor died in November 1980, the Executive of the Yorkshire Naturalists' Union and the Council of the Yorkshire Naturalists' Trust both agreed that the two organizations should combine to establish a fitting memorial to Dr Taylor, and that an appeal fund be opened.

All longstanding Yorkshire Naturalists will hardly need any explanation for the reasons behind this project, but perhaps those who have only more recently developed their interest in the natural history of the county may not be fully aware of the immense contribution that Dr Taylor made to both organizations, and to nature conservation in Yorkshire over the best part of this century.

Wilfred Taylor was a dedicated naturalist and served in high office in both the Yorkshire Naturalists' Union and the Yorkshire Naturalists' Trust, of which he was a founder member. He was rightly proud of the fact that he was the longest serving member of the Union, which he joined as a young man in 1911. In fact, in that year he joined the forerunner of the present Protection of Birds Committee and served continuously through to 1972, an incredible period of sixty-one years, the last twenty-four of which as chairman.

Wildlife conservation had always been a vital factor to Dr Taylor, and it was largely his dedicated leadership, enthusiasm and energy that steered the Yorkshire Naturalists' Trust into becoming a major organization for nature conservation.

Both the Union and the Trust therefore agreed that the most appropriate form of memorial to Dr Taylor would be the permanent protection of an important site of natural history interest as a nature reserve. It was felt that Dr Taylor would have fully approved.

At about this time an unprecedented number of extremely important sites started to come onto the market. These all merited protection, but without swift action the opportunity would almost certainly have been lost forever. The Yorkshire Naturalists' Trust then took the decision to launch a major appeal to raise £235,000 both for site acquisition and to finance other development objectives, but rather than having two appeals running concurrently, it was decided that the Wilfred Taylor Memorial Appeal be incorporated within the larger project.

By mutual agreement, Grass Wood in Upper Wharfedale was selected as being the most appropriate site for the Wilfred Taylor Memorial Reserve. The choice seemed especially fitting in view of Dr Taylor's early involvement in establishing a Trust reserve over part of this prime site, which he regarded as one of the most important woodlands in the limestone Dales. He had often expressed the hope that, one day, more permanent protection could be established over the whole 165-acre area.

A purchase price of £50,000 has now been agreed between the Trust and the Forestry Commission, and thanks to very generous help from various grant-aiding organizations and a number of private donors, the sum of £42,200 has so far been raised towards the purchase of Grass Wood. A further £8000 is all that is required before the sale is finally completed, and there will of course be additional legal charges. Eventually it is intended to hold a ceremony at Grass Wood at an appropriate time, for the purpose of unveiling some form of commemorative plaque to Dr Taylor.

All members of the Union and the Affiliated Societies will surely wish to be associated with this worthwhile project — the protection and security of a prime Yorkshire natural history site, and a fitting memorial to a very fine naturalist and a great gentleman.

GCV

Donations may be sent to:

'The Wilfred Taylor Memorial Appeal Fund'
℅ Lt-Col J. F. Newman
The Yorkshire Naturalists' Trust Ltd
20 Castlegate
York YO1 1RP

Details concerning covenanted donations may be obtained on application.

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Edited by M. R. D. SEAWARD, MSc, PhD, DSc, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

THE LEPIDOPTERA OF YORKSHIRE

Separates of the collected instalments which appeared serially in *The Naturalist* (1967–70) are available from Dr W. A. Sledge, Department of Plant Sciences, University of Leeds, Leeds 2. Price £1 plus 17p postage.

Y.N.U. NEWSLETTER

The Y.N.U. Newsletter, sent to all Full members and Affiliated Societies, is published twice a year: April and September; final copy dates are 31 January and 30 June. Its aim is to provide a means of intercommunication between all members by giving, for example, reports on Y.N.U. and Society meetings and activities, items of broad Natural History interest, details of types of surveys and enquiries. All items should be sent to the Newsletter Editor: Mr H. T. James, 238 Sigston Road, Beverley, Yorkshire.

Notice to Contributors to 'The Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

Subscription rates: Issued free to individual members of the Yorkshire Naturalists' Union and to Affiliated Societies.

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All subscriptions should be forwarded to:
Mr D. Bramley
c/o Doncaster Museum
Chequer Road
Doncaster DN1 2AE

AN ATLAS OF YORKSHIRE MAMMALS

Compiled by
C. A. HOWES
Doncaster Museum and Art Gallery

Historical Outline

In 1881 William Eagle Clarke and William Denison Roebuck published their now celebrated *Handbook of the Vertebrate Fauna of Yorkshire*. The mammal section was contributed by Roebuck who, as an avid and efficient bibliophile, accumulated an impressive body of records from the scientific literature, sporting and natural history journals, provincial newspapers, works on topography and local history as well as from correspondence with numerous landowners, gamekeepers and naturalists. These raw data, some of which still survive amongst the YNU documents lodged in the City Archives, Sheepscar, Leeds, formed the basis of his concise precis of the history, distribution and status of the forty-six mammal species, including wild cat and polecat, known to have occurred in a wild state in Yorkshire during the nineteenth century. Taxonomic revision of the cetaceans subsequently reduced this list to forty-five. Roebuck also mentioned four species which had become extinct during historic times, beaver, brown bear, wolf and wild boar and four known only from emparked stock, wild white cattle, red, fallow, and roe deer.

Oxley Grabham's (1907) useful, though little-used, review omitted harvest mouse and grey seal, but added lesser horseshoe bat (1875 Eavestone), Daubenton's bat (1891 Masham), Sei whale (1884 Goole), beluga (1903 Scarborough) and mountain hare. The last species was added on the strength of 'a few specimens . . . turned down on some of the wild fells in the north west of the county'. If correct, this comment would seem to refer to animals additional to those liberated in the Greenfield area in the 1860s and 1881 and on Broomhead Moor in the 1870s, which formed the basis of the present southern Pennine population.

Taylor's (1956) much-quoted 'Summary of our knowledge of Yorkshire mammals 1851–1895' only reviewed the bats and terrestrial species. A misinterpretation of an 1865 record led him to include the greater horseshoe bat, but the species is retained on the current list on the basis of a record from Roche Abbey in 1896. He added barbastelle (1919 Helmsley) along with the grey squirrel which was liberated at Scampston in 1906 and 1914, Bedale in 1913, Bingley in 1914 and Walshaw in 1921. Both red deer (once wild in Yorkshire) and fallow deer, known to Clarke and Roebuck (1881) and Grabham (1907) only as emparked stock, were listed as free range animals. Roe deer, believed not to have survived in the wild state later than the fourteenth century, was re-instated on the strength of an 'unproved record' from the Ampleforth area. Subsequent work has traced the earliest modern record to one in the Low Dalby area in 1936.

Spalding's (1966) exhaustive and critical survey of Yorkshire and Lincolnshire cetacean records added Sowerby's whale (1885 Humber mouth), false killer whale (1935 Hornsea), white-sided dolphin (1928 Whitby) and common dolphin (1936 Kilnsea).

Although written for popular appeal, Hazelwood (1971) provided the first account since 1907 to deal with all mammal groups. Her review added to the Yorkshire list the yellow-necked mouse, based on an unsubstantiated record from Conisbrough in 1956, coypu, a pair of which introduced to the Treeton area in 1960 subsequently bred, sika deer, which had been introduced into the Bolton-by-Bowland area in about 1907, and American mink, escapees from mink farms being reported as early as 1960 and feral populations from 1965.

The present account, providing the first definitive list since 1881, adds red-necked wallaby (1977 Sheffield), Brandt's bat (1972 Smelthouses), though examination of museum specimens has established its presence in the county back to 1896, serotine (1977 Greasbrough), musk rat (*c.* 1935 Thorne Moors area), and harvest mouse (re-instated 1972 Thorne Moors). Gerbil, escaped pets and school laboratory animals, have been found at large in five localities, though as yet feral populations remain unproved. Feral ferret is formally added, a breeding population being discovered in one locality during the 1970s, though escaped 'working' animals are commonly reported and were known to Clarke and Roebuck and subsequent reviewers. Other new entries are feral dog and feral cat, whose distribution and ecological status are currently

under investigation, grey seal, modern occurrences of which commenced during the 1940s and now greatly outnumber those of common seal, muntjac (1973 South Landing, Flamborough), and water deer, two waves of escapes from Studley Royal Park in 1952 and 1954 being previously attributed to muntjac.

Escaped exotics, raccoon, coati and various unspecified sciuromorphs (eg chipmunks, ground squirrels), published in YNU Annual Reports, have been included for completeness.

Mapping Scheme

In 1965 the Mammal Society launched its national mammal distribution scheme, its aim being to gather and map on a 10 km × 10 km basis historical and current data on all British mammals except deer, which came under the British Deer Society's own scheme. As no similar mapping exercise had been attempted in Yorkshire, apart from work on red and grey squirrel (Shorten 1946 and Lloyd 1962), the YNU had a particular interest in the project and Yorkshire data were contributed by its members. The resulting 'Provisional distribution maps of British mammals' (Corbet 1971) highlighted many interesting trends, but in common with most preliminary atlases, emphasized the districts in need of further attention.

In 1971 the YNU Mammal and Lower Vertebrates Section launched its own mammal mapping scheme, with a view to supplying additional records for subsequent editions of the national distribution maps and ultimately producing its own atlas of Yorkshire mammals 1971–1981, the latter date being significantly the centenary of the production of Clarke and Roebuck's *Handbook*.

The project was launched and periodically canvassed and reviewed at YNU Vertebrates Section meetings. Appeals were made directly and through the YNU Newsletter to YNU members and affiliated societies. From 1977 to 1980 talks canvassing the scheme were given by the mammal recorder to fifty-seven natural history organizations throughout the county. Various local societies and museums organized a variety of highly successful mammal recording projects which received newspaper, local radio and TV coverage — eg red and grey squirrel distribution, hedgehog road casualties and domestic cat prey. An atlas of east Yorkshire mammals (Howes 1980) was produced for the Hull Natural History Society's Centenary which stimulated considerable additional recording for this traditionally sparsely-worked area.

Records were received from fifteen local natural history societies, ten nature reserves and country parks, and three bird observatories and ringing stations. It is worth noting here that whilst scientific journals have tended to become less anecdotal and more analytical, a recent proliferation of local society publications and nature reserve reports now provides an important source of records.

Data from a wide variety of sources were gathered by museum-based biological data banks. Those at Doncaster, Keighley, Rotherham, Scarborough and Sheffield made major contributions at the end of the survey period when all 1971–1981 records on their files were forwarded on specially-prepared vice-county tetrad maps.

In addition, ninety individual workers forwarded records.

From 1971 to 1981 some 40,000 records were forwarded to the YNU mammal recorder based at Doncaster Museum and Art Gallery. All map references were checked against the 1:50,000 Series Ordnance Survey maps. Where possible, records received without map references were allocated to the nearest 10 km × 10 km grid square, after using Gazetteers, Ordnance Survey maps and consulting with the field recorder. These data, along with the records from the vice county tetrad maps, were plotted onto 10 km × 10 km, and where appropriate 2 km × 2 km, county distribution maps. After processing, records in manuscript form with accompanying correspondence were stored in yearly batches; these can be consulted on application to the YNU mammal recorder.

Up to 1976 records were forwarded to the Biological Records Centre, Monks Wood, Huntingdonshire on their single-species mammal record cards (RA 12) and were included in the *Provisional Atlas of Mammals of the British Isles* (Arnold 1978).

Data have also been contributed to national surveys of harvest mouse, water vole and urban fox.

Casual field observations, road casualties and less frequently keepers' gibbets have produced the majority of records. Bat records have only been accepted when specimens have been verified by competent referees.

Field signs (eg scats, molehills, harvest mouse nests and characteristically gnawed hazel nuts) have facilitated productive surveying of briefly visited sites, but due to difficulties in positive identification, footprints have generally only been accepted when accompanied by other supporting evidence.

Dental and skeletal evidence from predator diet studies (the analysis of mustelid guts, fox scats and pellets of kestrel and five species of owl) have produced lists of small mammals from numerous otherwise unworked districts. The origin of the prey species, however, cannot be precisely ascertained owing to predator mobility, though as the species identified in the diets have usually been those expected to occur in the areas where the diets were collected, it is unlikely that any serious mapping inaccuracies occurred.

Dental and skeletal identifications were also employed in the determination of small mammal remains found in discarded bottles and ring-pull drinks cans. This source had the advantage of giving the precise locality of the species concerned.

Live trapping projects, whilst providing accurately plotted and identified lists of small mammals and valuable biological data not obtainable by any other method, were too few to have a major effect on the overall mapping scheme.

Survey Area and Coverage

Yorkshire is represented by the pre-1974 government boundaries, the area being sub-divided into the five 1859 Watsonian vice-counties 61–65. Two sets of maps have been produced for each mammal species, the first based on 10 km × 10 km grid square units, the scale of the primary atlas envisaged at the inception of the survey. This corresponds with the system used in the national surveys (Corbet 1971 and Arnold 1978) and can be used to update these works. Yorkshire extends into 198 10 km squares, 195 of which have at least one post-1971 mammal record. Because of the relatively large size of this recording unit in relation to the size of the county the maps only crudely indicate meaningful distribution patterns and require comparison with the national maps for better elucidation and interpretation.

2 km × 2 km (tetrad) maps constructed from records accompanied by sufficiently detailed map references are also presented, in an attempt to identify patterns of distribution which relate specifically to the topography of Yorkshire. However, as many records received, particularly during the early stages of the survey, were only accompanied by, or traceable to, 10 km × 10 km units, the tetrad maps currently fail to achieve the coverage of the primary atlas. Even so, records are available for *c.* 2600 (63.4 per cent) of 4100 tetrads in the study area.

Interpretation

Concentrations of records around Scarborough, Keighley and the south Yorkshire area, the results of intensive mammal surveys, heavily bias the overall distribution patterns but can, if regarded as 'sample plots', give an enhanced impression of overall distribution and effects of environmental features on local patterns of occurrence.

Maps which most accurately represent distribution and density are for those species which have been the subject of special studies, eg badger, otter and harvest mouse. The maps for the deer species give a fair representation of their recently expanded distribution, the one for roe deer showing well its strongholds in the afforested areas in the north-east Yorkshire uplands, together with the wide scatter of localities colonized since the 1960s.

The map for mountain hare shows precisely the range in Yorkshire of its south Pennine population being confined to areas above 650 ft (200 m), and that for harvest mouse demonstrates its lowland and river valley distribution, occurring mainly below the 50 ft (15 m) contours.

Records of mink are sparse but indicate a wide distribution. Their infrequency in the intensively studied areas of southern and eastern Yorkshire suggests that its main headquarters are confined to the Pennines and major river systems of mid-west Yorkshire.

The hedgehog and mole, apparently ubiquitous according to their 10 km × 10 km maps, show local differences in distribution patterns when plotted on a 2 km × 2 km scale. The hedgehog's association with urban areas is emphasized by dense recording along the urbanized and industrialized Aire valley and throughout the Sheffield/Rotherham conurbation, in contrast with their relative infrequency along the well-worked dales and southern Pennine weekend tourist routes. The mole, however, densely recorded in these same rural areas, is largely absent from urbanized districts, a 'mole-desert' coming to light in urban Sheffield.

Acknowledgements

(*) major contributors; (P) mammal records published in society journals, annual reports or newsletters.

Local Natural History Societies: (*) Barnsley Naturalists' and Scientific Society; Beverley Naturalists' Society; (P) Bradford Naturalists' Society; (*P) Castleford and District Naturalists' Society; (P) Doncaster Naturalists' Society; (P) Doncaster and District Ornithological Society; Goole and District Naturalists' Society; (P) Harrogate and District Naturalists' Society; Hornsea Bird Club; (*) Hull Natural History Society; Rotherham Naturalists' Society; (*P) Sorby Natural History Society; (P) Wakefield Naturalists' Society; (*) Wharfedale Naturalists' Society; Yorkshire Mammal Group.

Bird Observatories, Ringing Stations, Nature Reserves and Country Parks: (P) Blacktoft Sands Nature Reserve (RSPB); (P) Carleton Marsh Nature Reserve (Barnsley MBC); (P) Fairburn Ings Nature Reserve (RSPB); (P) Filey Brigg Bird Observatory; Hornsea Mere Nature Reserve (RSPB); Howell Wood Country Park (South Yorkshire CC); (P) Knaresborough Ringing Station; (P) Potteric Carr Nature Reserve (YNT); Sandall Beat Wood Nature Reserve; (P) Spurn Bird Observatory; (P) Thorne Moors SSSI (NCC); Thorpe Marsh Nature Reserve (CEGB); Worsbrough Country Park (South Yorkshire CC).

Biological Data Banks: Cliffe Castle Museum, Keighley; Clifton Park Museum, Rotherham; Doncaster Museum and Art Gallery; Weston Park Museum, Sheffield; Wood End Natural History Museum, Scarborough; Yorkshire Museum, York.

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A Checklist of Yorkshire Mammals

+ = Extinct during historic times
○ = Post 1800 but not recorded since 1970
* = Post 1970
E = Escapee not known to have established feral population
[] = Identity not verified

Order Marsupialia

* Red-necked Wallaby *Macropus rufogriseus* (Desmarest)

Order Insectivora

* Hedgehog *Erinaceus europaeus* L.
* Mole *Talpa europaea* L.
* Common Shrew *Sorex araneus* L.
* Pygmy Shrew *S. minutus* L.
* Water Shrew *Neomys fodiens* (Pennant)

Order Chiroptera

○ Greater Horseshoe Bat *Rhinolophus ferrumequinum* (Schr.)
○ Lesser Horseshoe Bat *R. hipposideros* (Bechstein)
* Whiskered Bat *Myotis mystacinus* (Kuhl)
* Brandt's Bat *M. brandti* (Eversmann)
* Natterer's Bat *M. nattereri* (Kuhl)
* Daubenton's Bat *M. daubentoni* (Kuhl)
* Serotine *Eptesicus serotinus* (Schr.)
* Leisler's Bat *Nyctalus leisleri* (Kuhl)
* Noctule *N. noctula* (Schr.)
* Pipistrelle *Pipistrellus pipistrellus* (Schr.)
○ Barbastelle *Barbastella barbastellus* (Schr.)
* Brown Long-eared Bat *Plecotus auritus* (L.)

Order Lagomorpha

* Rabbit *Oryctolagus cuniculus* (L.)
* Brown Hare *Lepus capensis* L.
* Mountain Hare *L. timidus* L.

Order Rodentia

+ Beaver *Castor fiber* L.
* Red Squirrel *Sciurus vulgaris* L.
* Grey Squirrel *S. carolinensis* Gmelin
*E 'Ground Squirrel'

○E 'Chipmunk'
○E 'Striped Squirrel'
○E 'Malabar Squirrel'
* Bank Vole *Clethrionomys glareolus* (Schr.)
* Field Vole *Microtus agrestis* (L.)
* Water Vole *Arvicola terrestris* (L.)
○E Musk Rat *Ondatra zibethicus* (L.)
* Wood Mouse *Apodemus sylvaticus* (L.)
○ [Yellow-necked Mouse *A. flavicollis* (Melchior)]
* Harvest Mouse *Micromys minutus* (Pallas)
* House Mouse *Mus musculus* L.
* Ship Rat *Rattus rattus* (L.)
* Common rat *R. norvegicus* (Berkenhout)
*E Gerbil *Meriones unguiculatus* Milne Edwards
* Dormouse *Muscardinus avellanarius* (L.)
○E Coypu *Myocastor coypus* (Molina)

Order Cetacea

○ Common Rorqual *Balaenoptera physalus* (L.)
* Lesser Rorqual *B. acutorostrata* (Lacepède)
○ Sei Whale *B. borealis* Lesson
○ Blue Whale *B. musculus* (L.)
○ Sperm Whale *Physeter catodon* L.
○ Bottle-nosed Whale *Hyperoodon ampullatus* (Forster)
* Sowerby's Whale *Mesoplodon bidens* (Sowerby)
○ Beluga *Delphinapterus leucas* (Pallas)
○ [Narwhal *Monodon monoceros* L.]
* Porpoise *Phocoena phocoena* (L.)
○ Killer Whale *Orcinus orca* (L.)
○ False Killer Whale *Pseudorca crassidens* (Owen)
○ Pilot Whale *Globicephala melaena* (Traill)
* White-beaked Dolphin *Lagenorhynchus albirostris* Gray
* White-sided Dolphin *L. acutus* (Gray)
○ Bottle-nosed Dolphin *Tursiops truncatus* (Montague)
* Common Dolphin *Delphinus delphis* L.

Order Carnivora

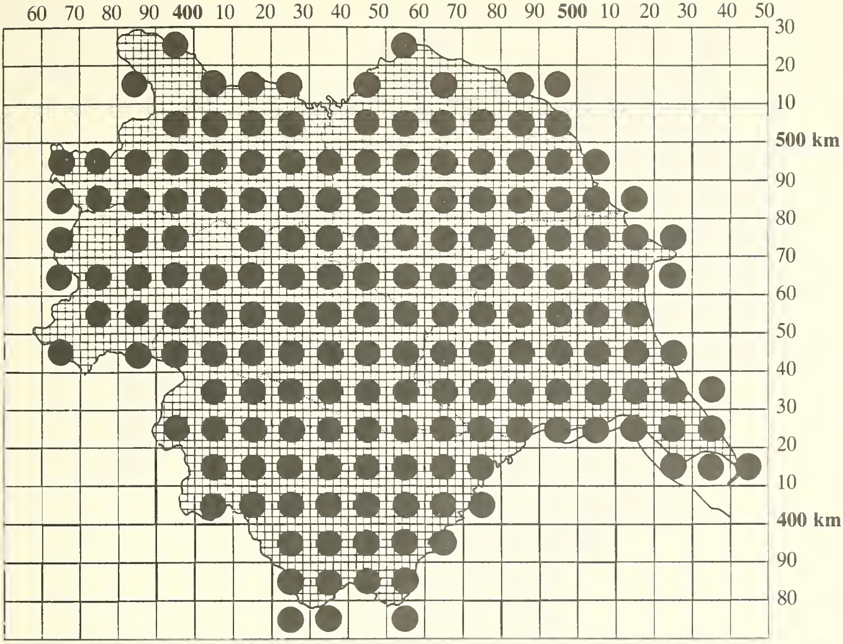
+ Wolf *Canis lupus* L.
* Feral Dog *C. familiaris* L.
* Fox *Vulpes vulpes* (L.)
* Pine Marten *Martes martes* (L.)
* Stoat *Mustela erminea* L.
* Weasel *M. nivalis* L.
○ Polecat *M. putorius* L.
* Feral Ferret *M. furo* L.
* American Mink *M. vison* Schr.
* Badger *Meles meles* (L.)
* Otter *Lutra lutra* (L.)
○ Wild Cat *Felis silvestris* Schr.
* Feral Cat *F. catus* L.
*E Raccoon *Procyon lotor* L.
*E Coati *Nasua narica* L.

Order Pinnipedia

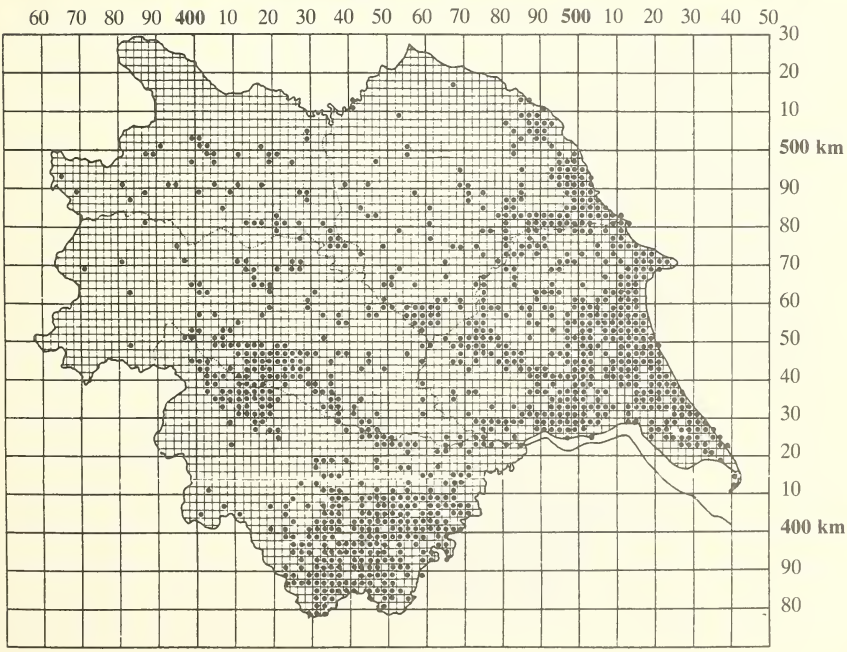
* Common Seal *Phoca vitulina* L.
* Grey Seal *Halichoerus grypus* (Fab.)

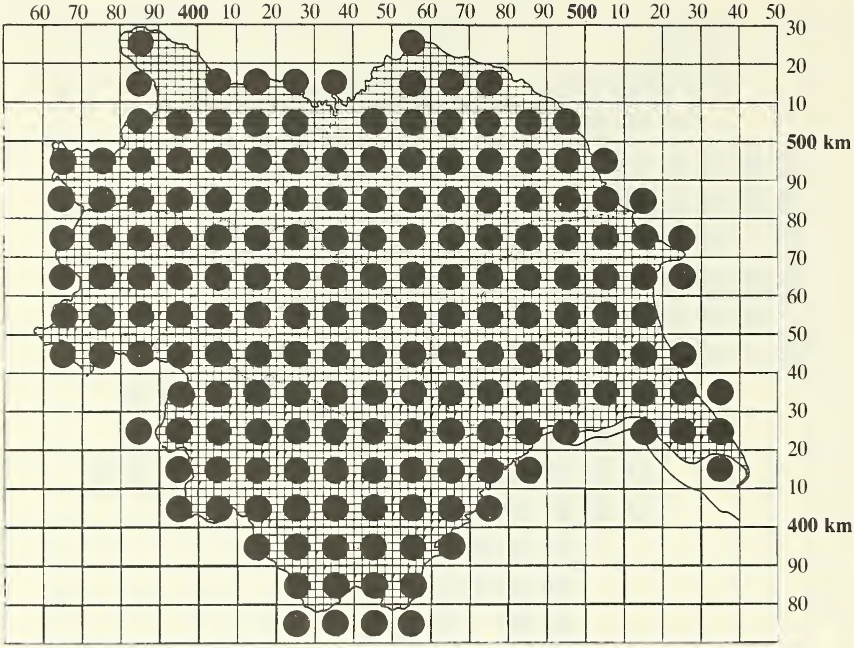
Order Artiodactyla

+ Wild Boar *Sus scrofa* L.
* Red Deer *Cervus elaphus* L.
* Sika Deer *C. nippon* Temminck
* Fallow Deer *Dama dama* (L.)
* Roe Deer *Capreolus capreolus* (L.)
*E Muntjac *Muntiacus reevesi* (Ogilby)
○E Water Deer *Hydropotes inermis* Swinhoe
○ Feral Goat *Capra hircus* L.

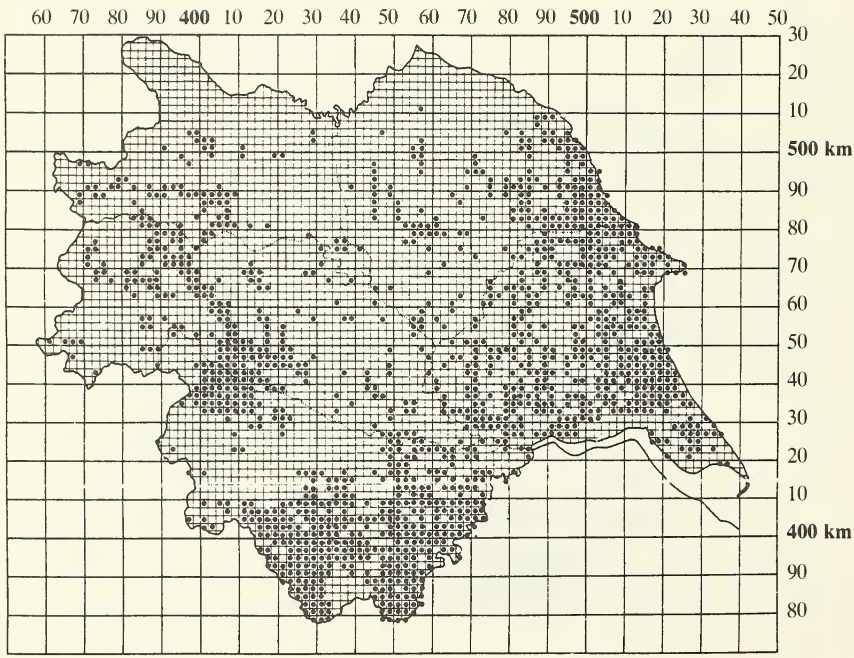


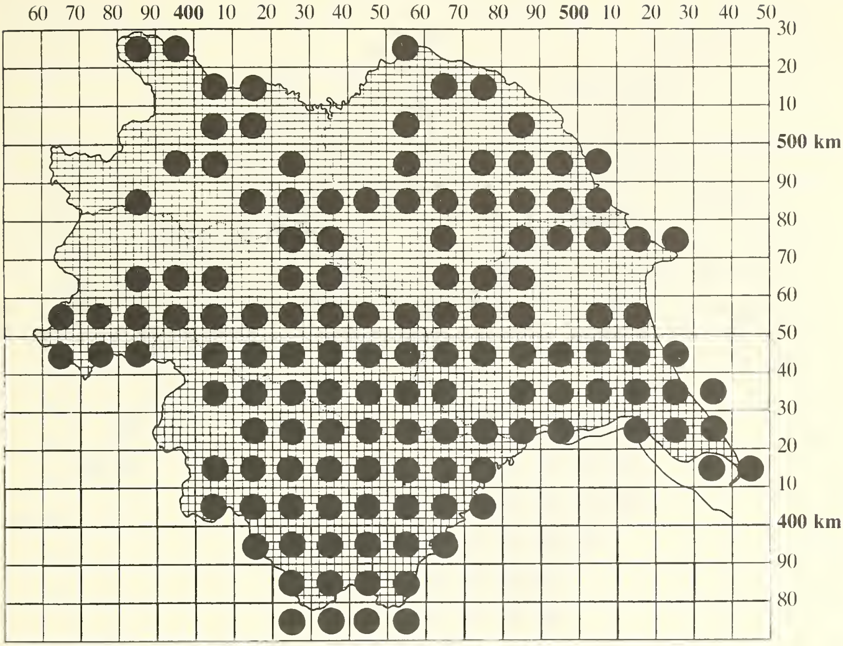
Hedgehog *Erinaceus europaeus* L.



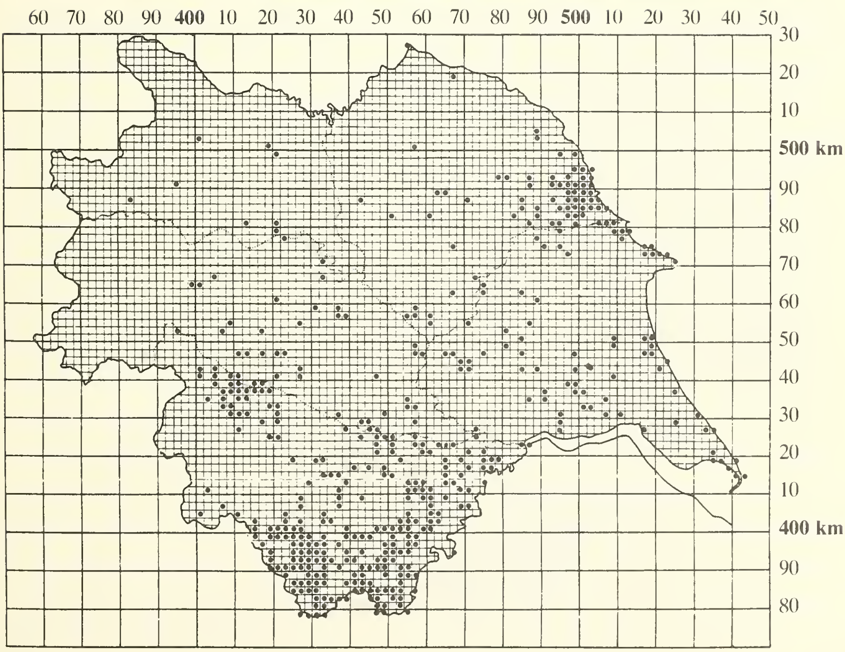


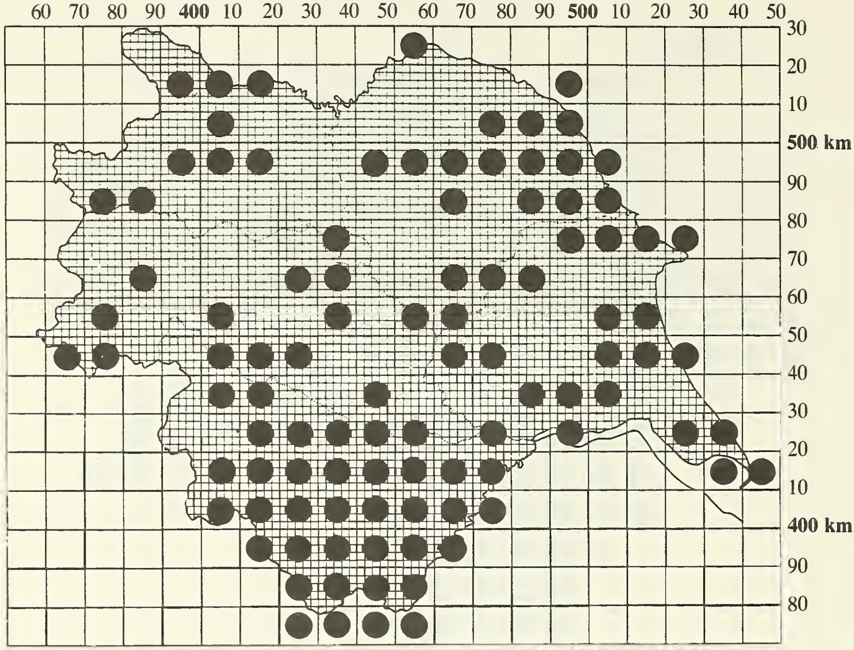
Mole *Talpa europaea* L.

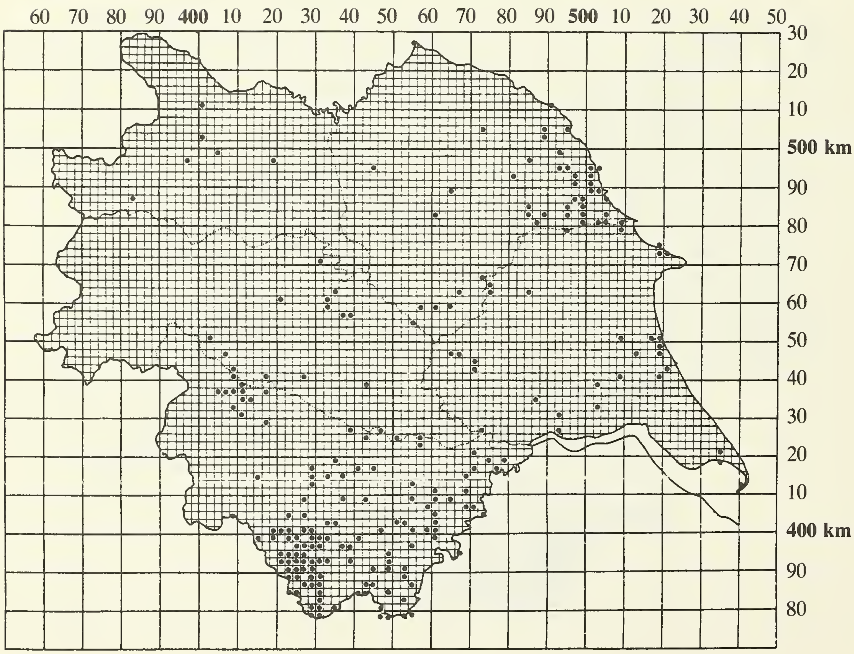




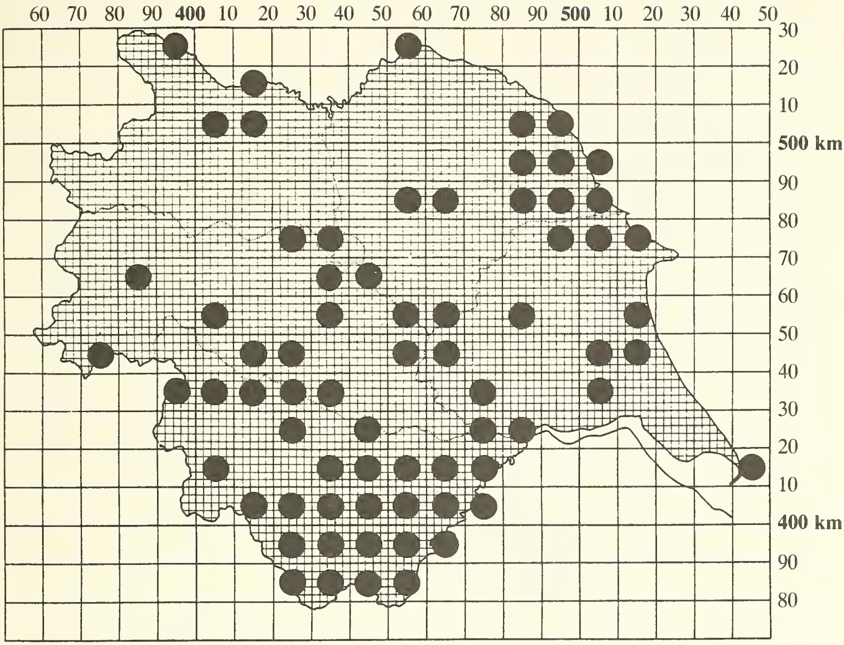
Common Shrew *Sorex araneus* L.



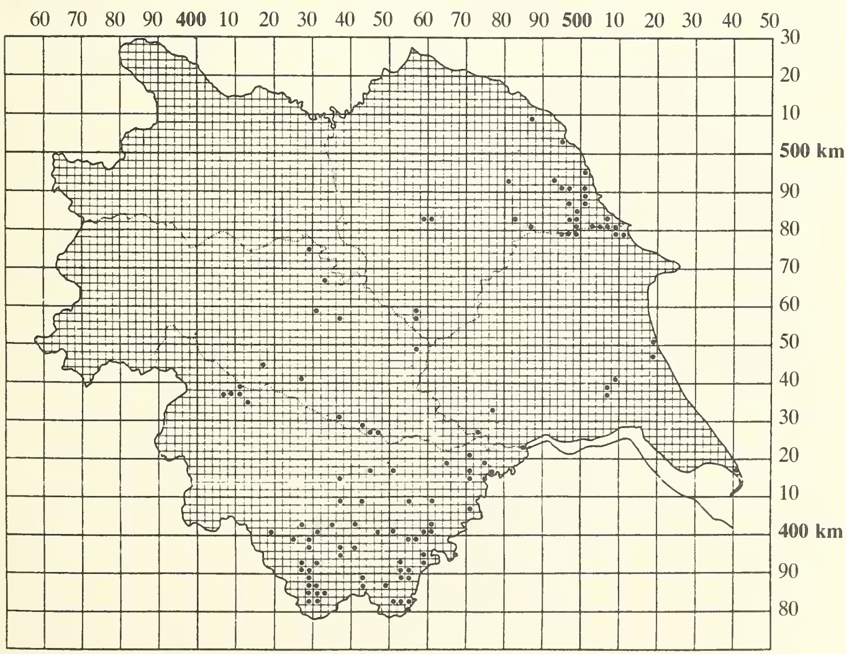


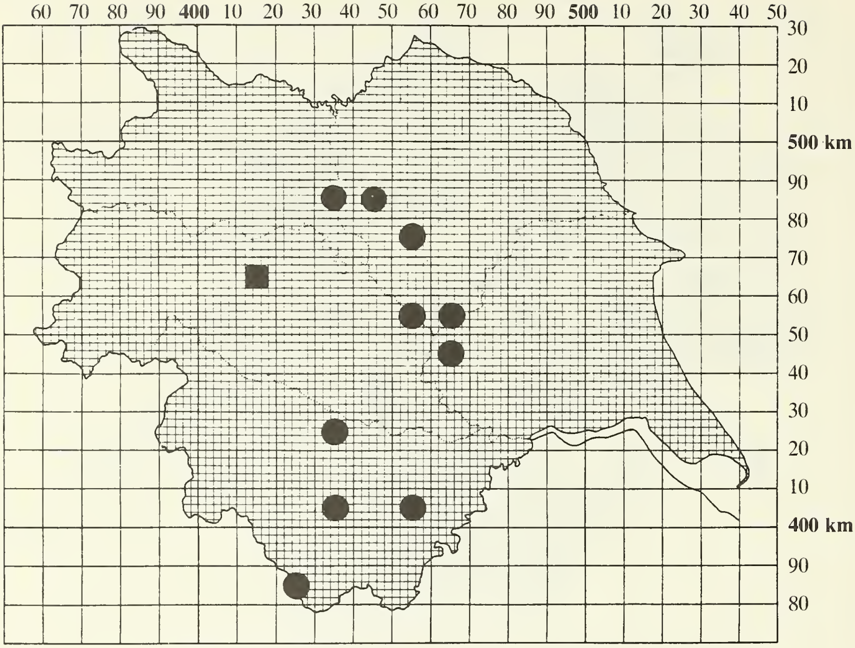


Pygmy Shrew *Sorex minutus* L.

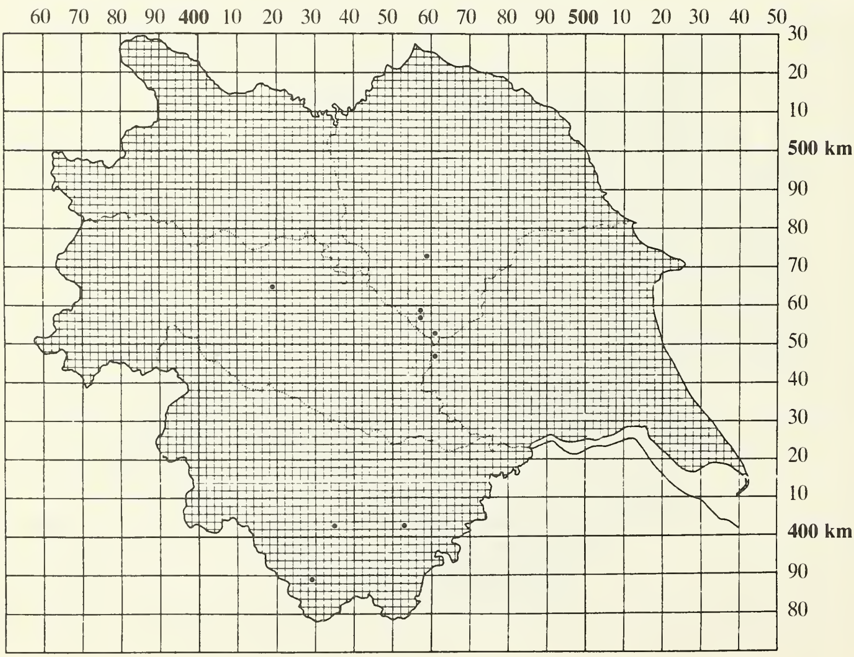


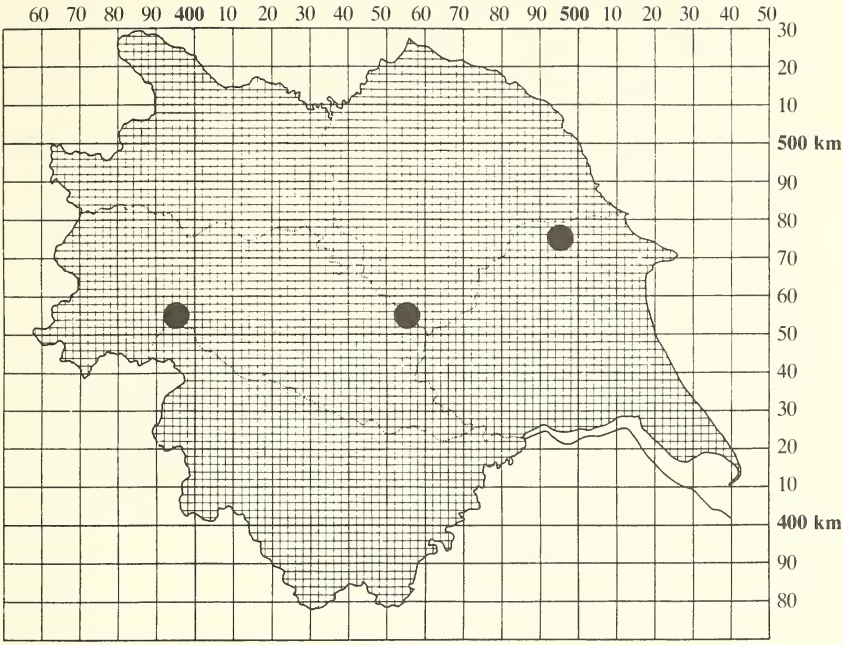
Water Shrew *Neomys fodiens* (Pennant)



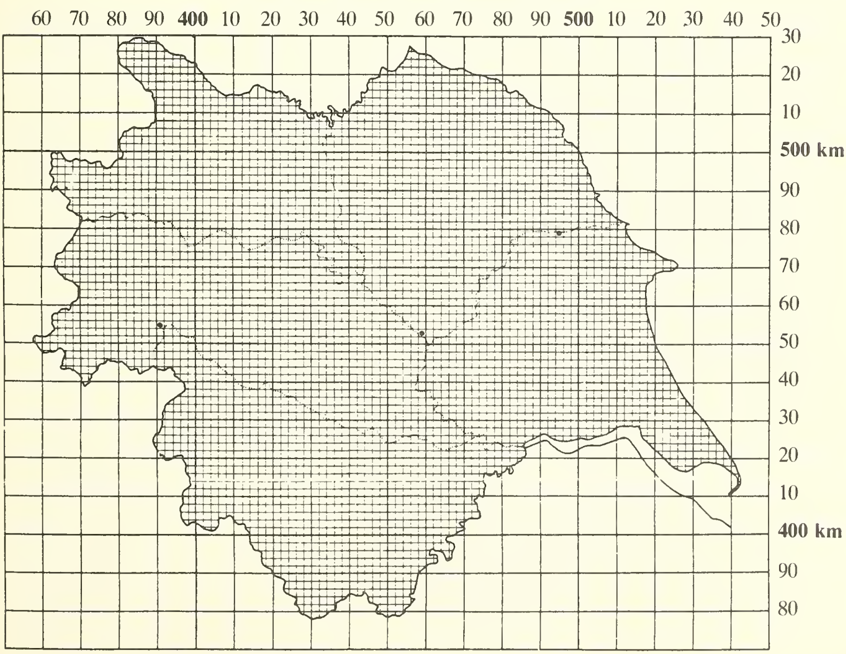


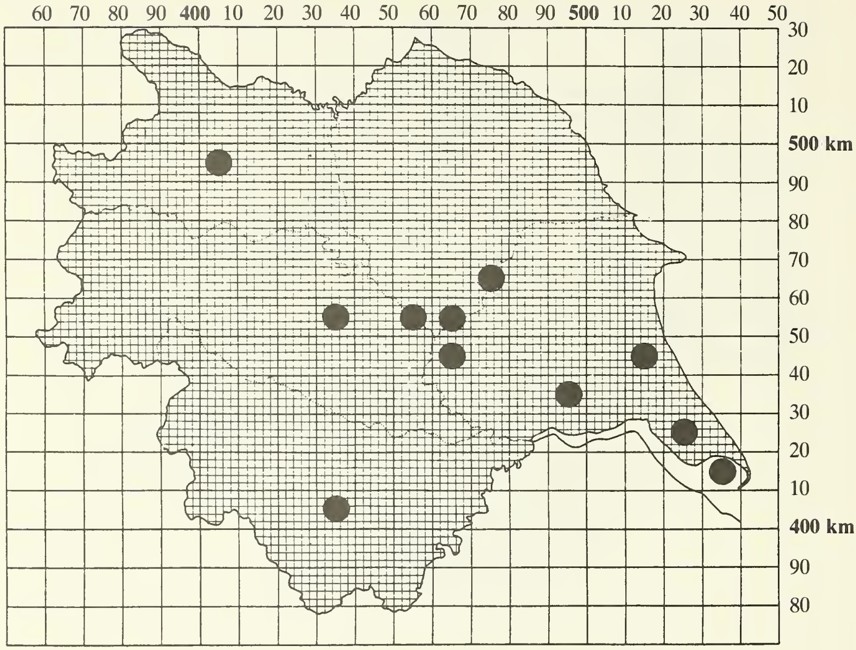
Whiskered Bat *Myotis mystacinus* (Kuhl) = ● Brandt's Bat *M. brandti* (Eversmann) = ■



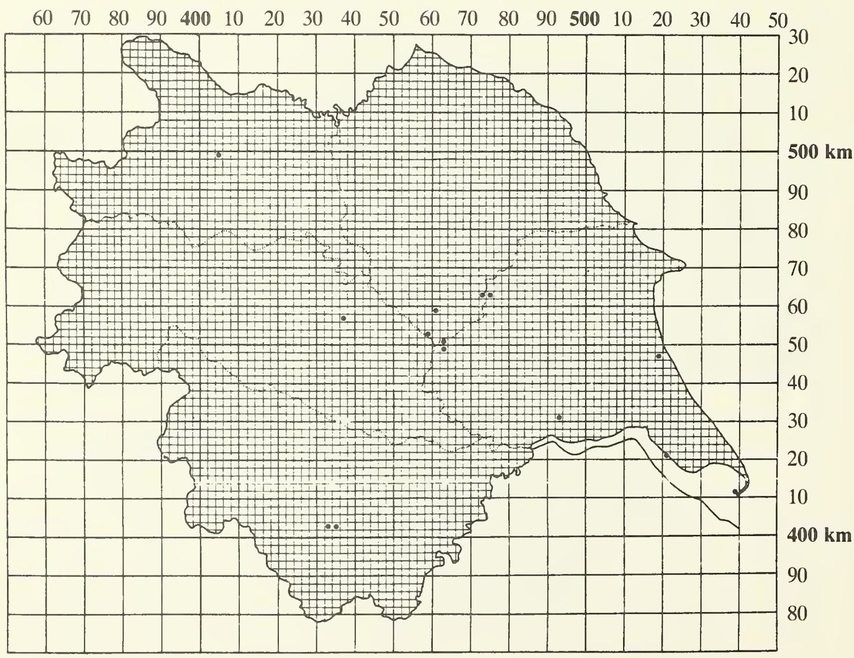


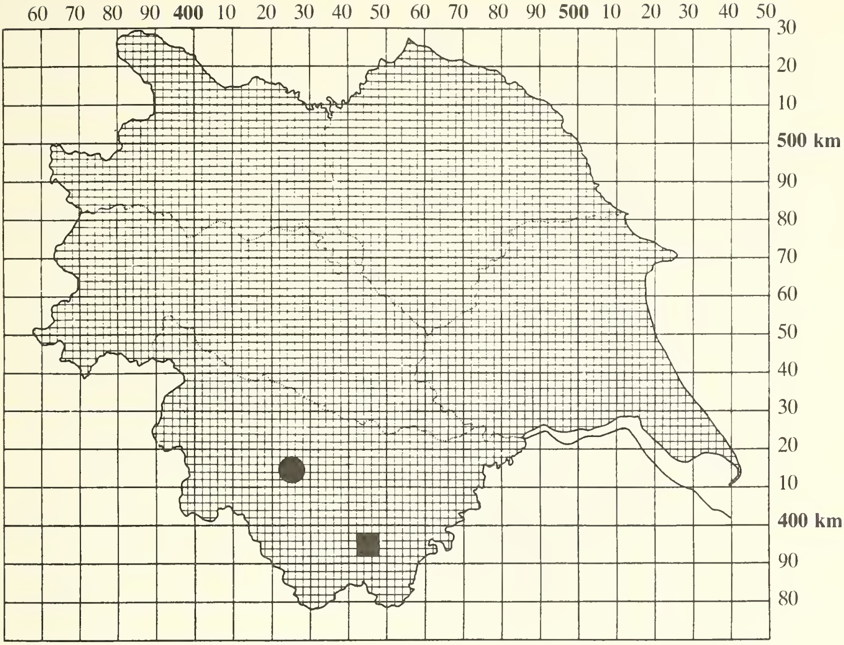
Natterer's Bat *Myotis nattereri* (Kuhl)



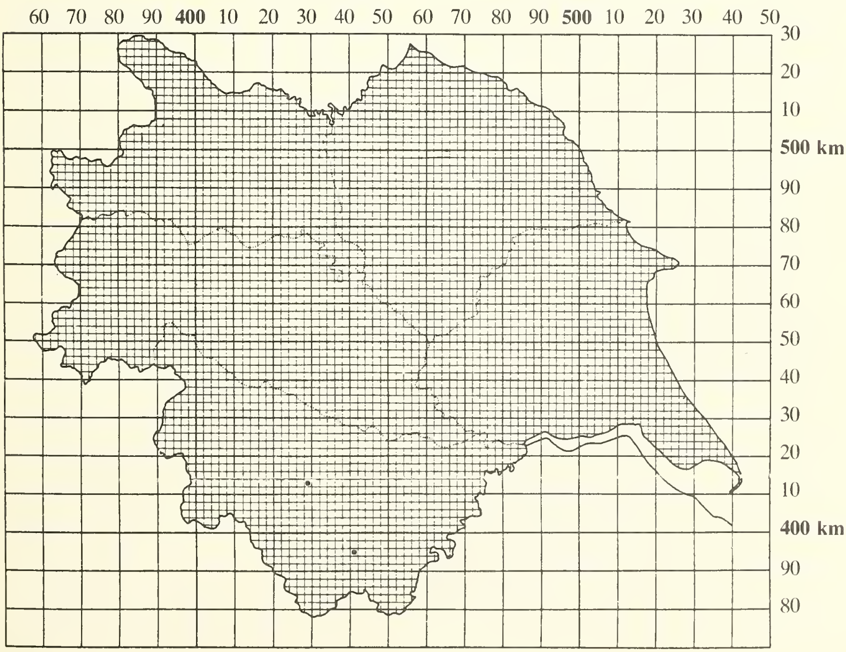


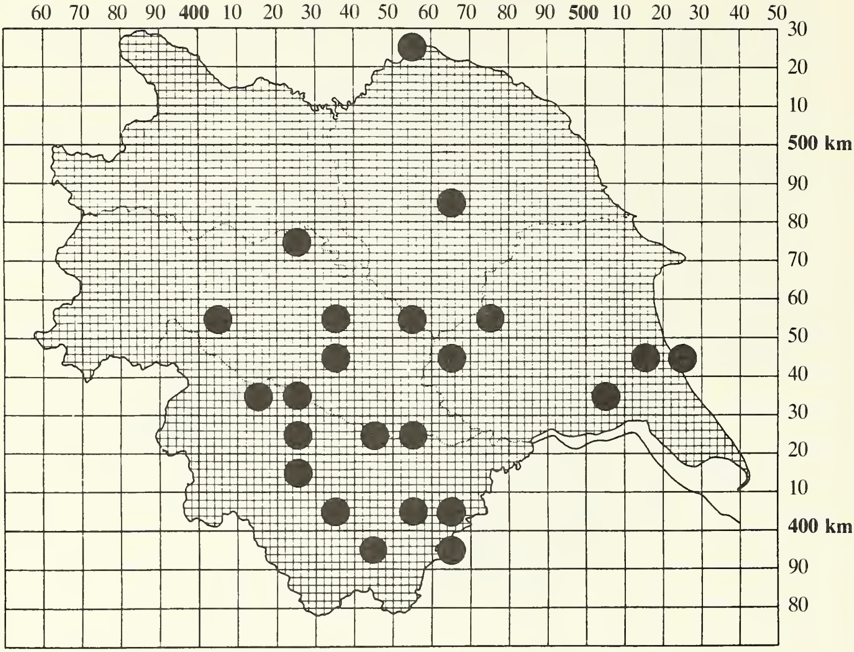
Daubenton's Bat *Myotis daubentoni* (Kuhl)



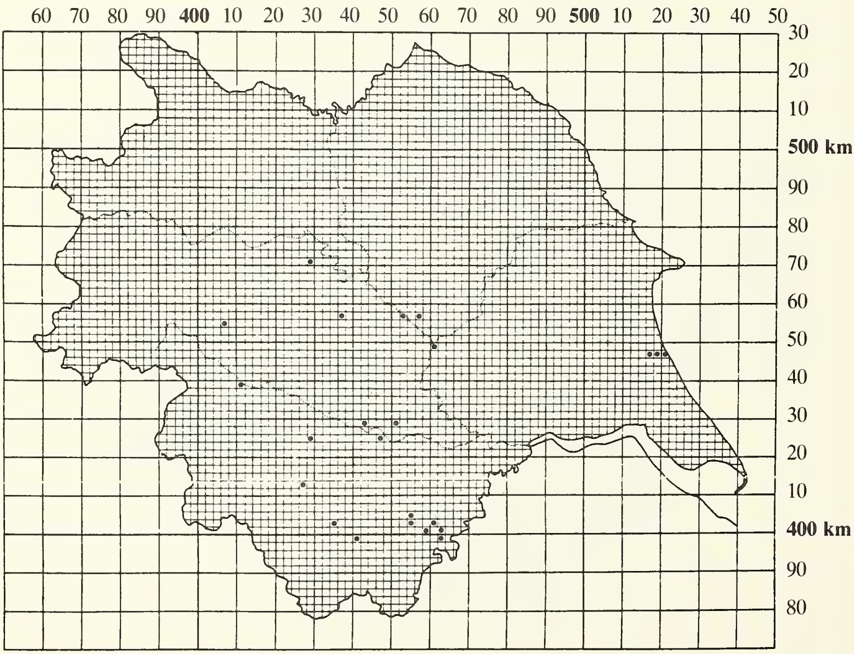


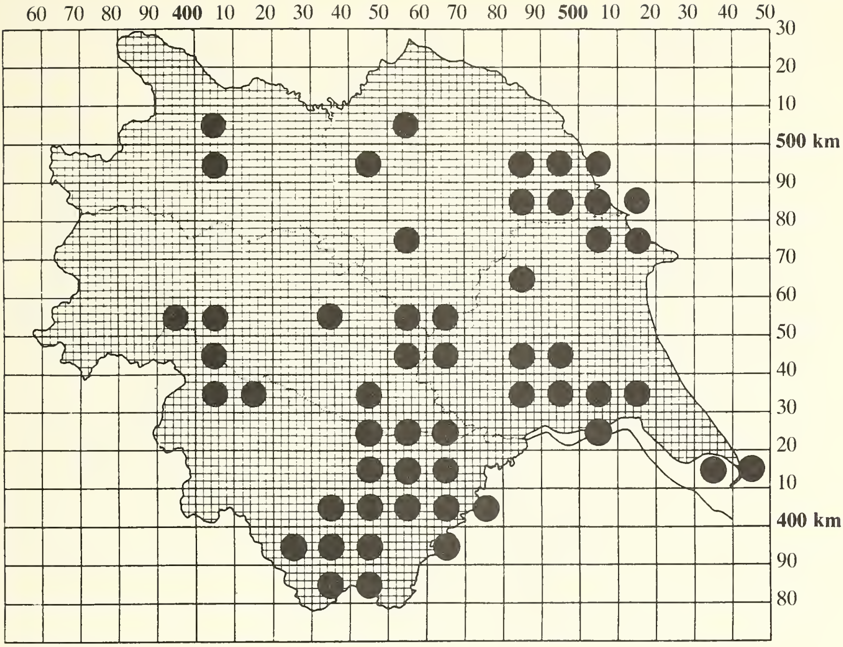
Serotine *Eptesicus serotinus* (Schr.) = ■ Leisler's Bat *Nyctalus leisleri* (Kuhl) = ●



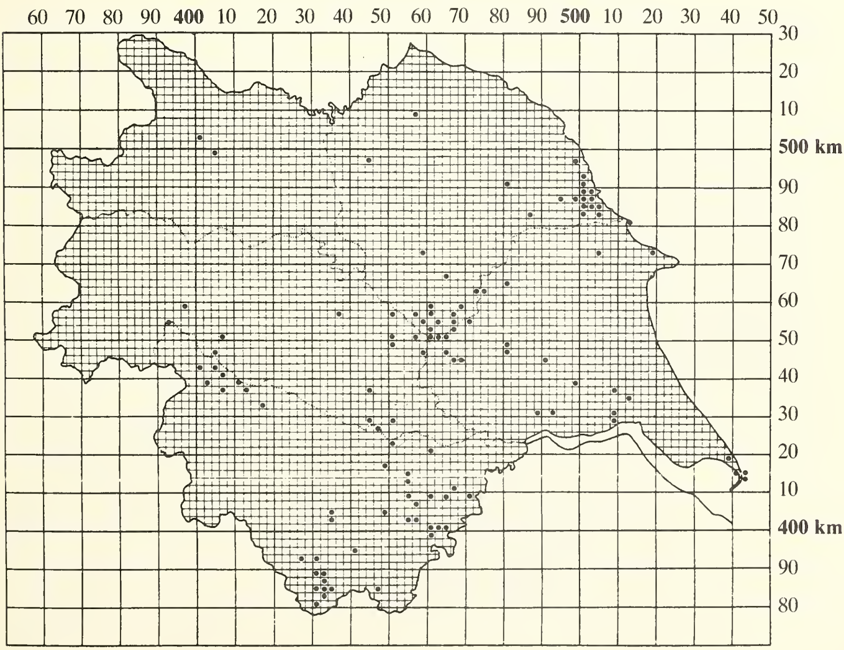


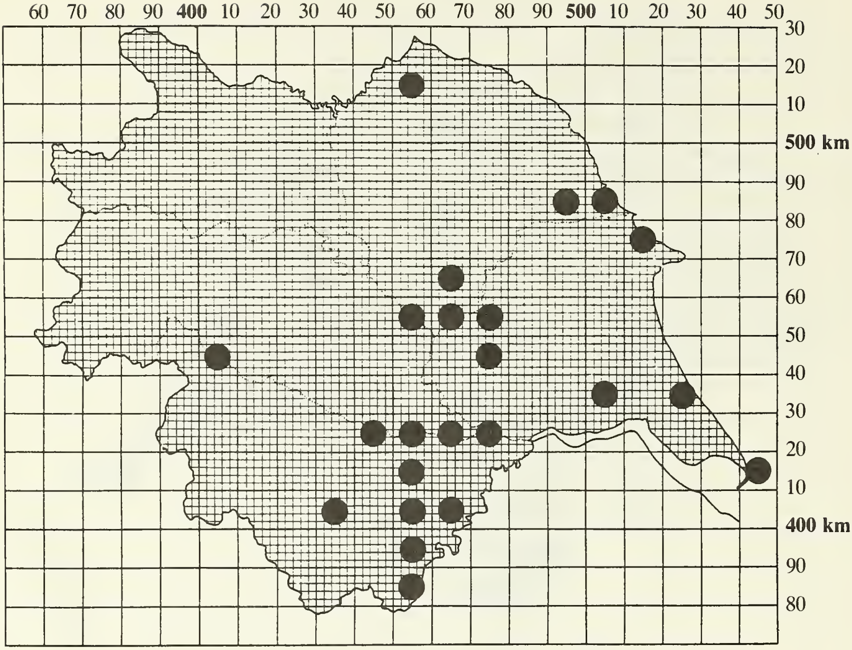
Noctule *Nyctalus noctula* (Schr.)



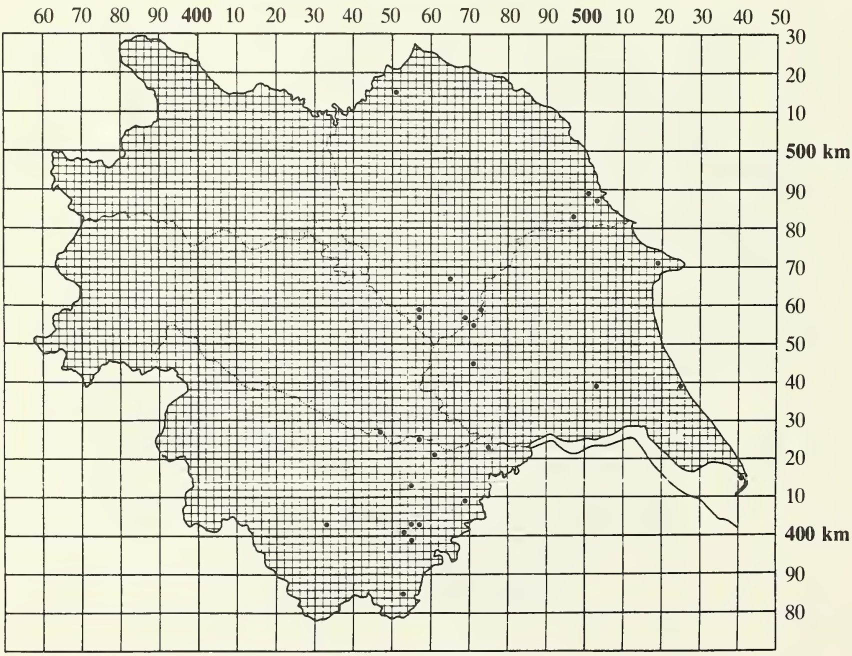


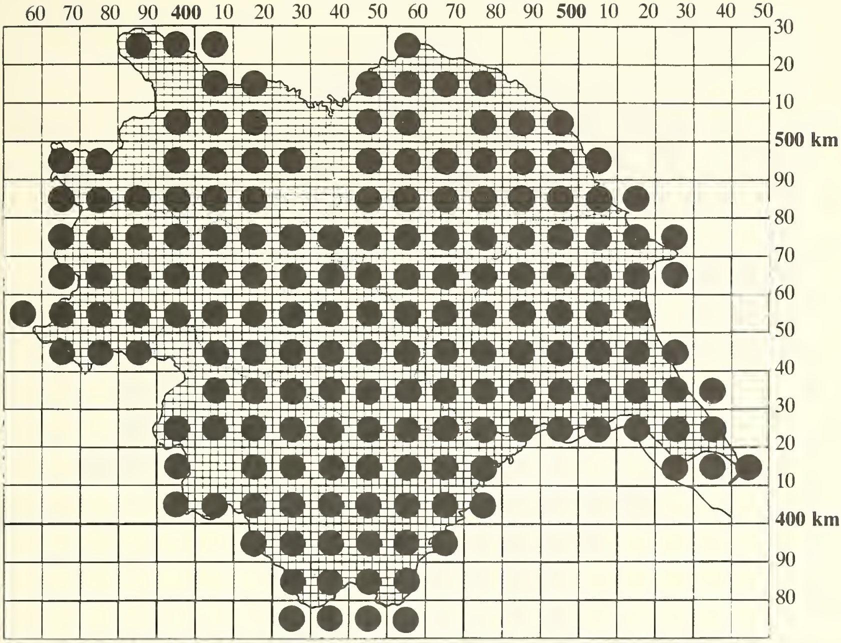
Pipistrelle *Pipistrellus pipistrellus* (Schr.)



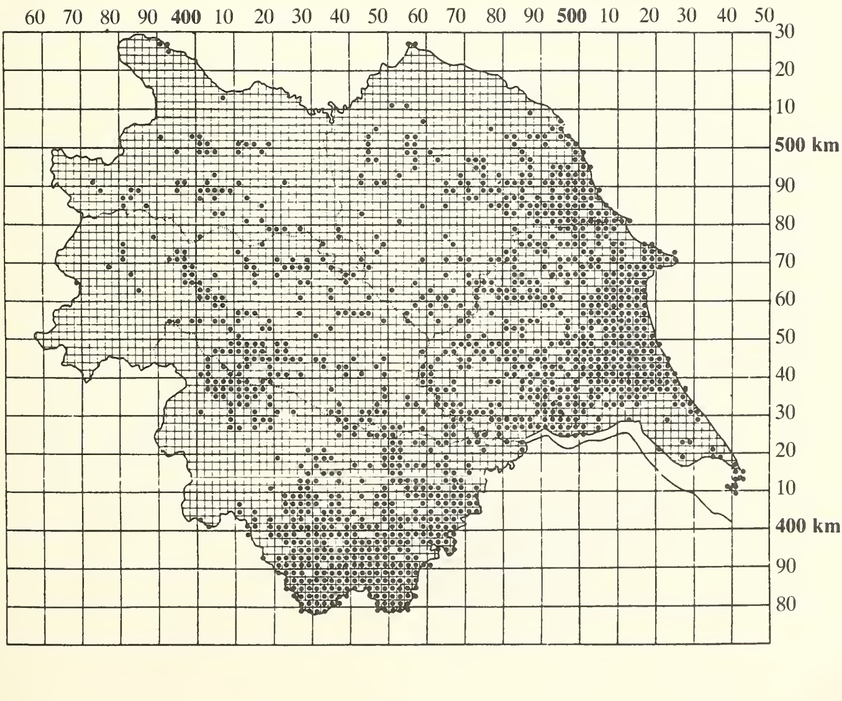


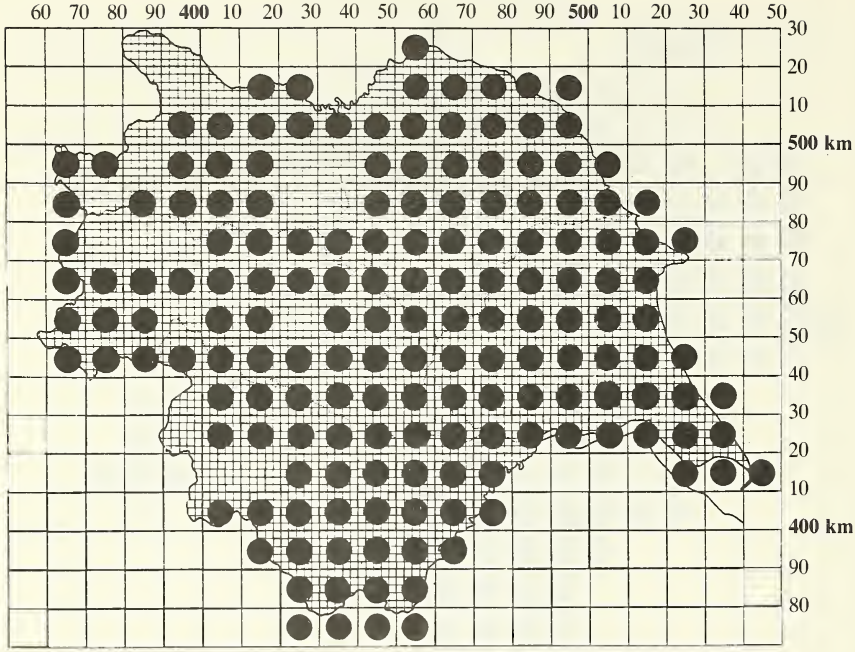
Brown Long-eared Bat *Plecotus auritus* (L.)



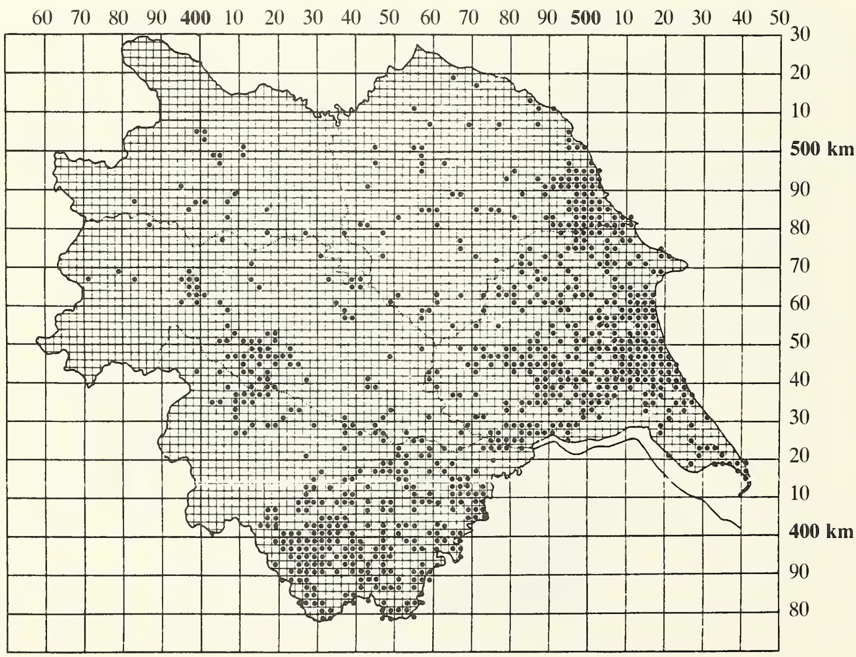


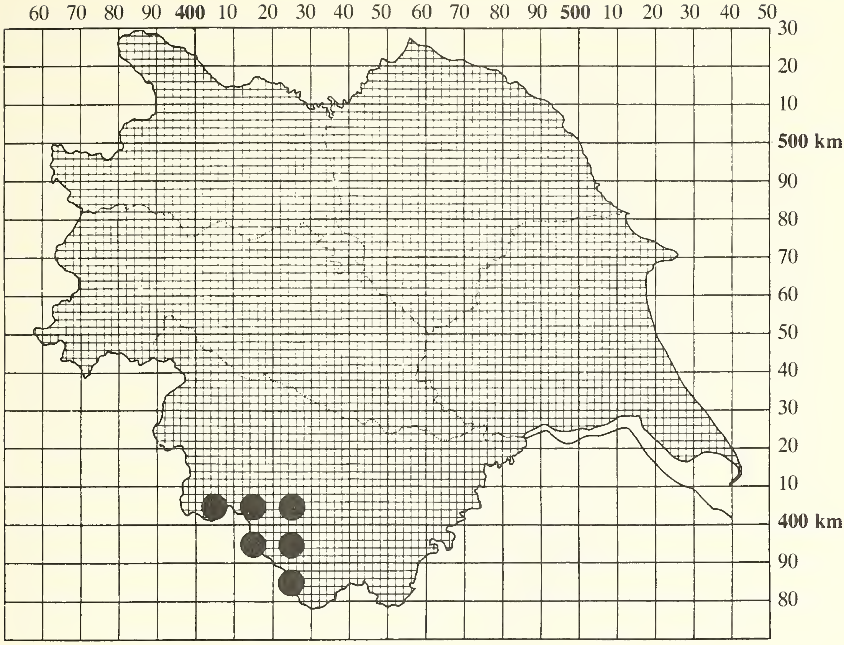
Rabbit *Oryctolagus cuniculus* (L.)



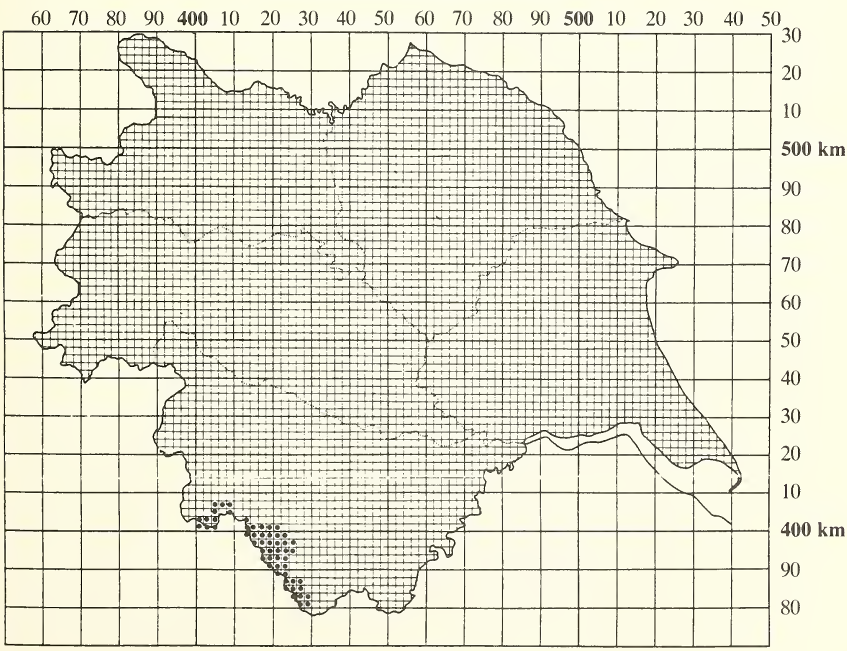


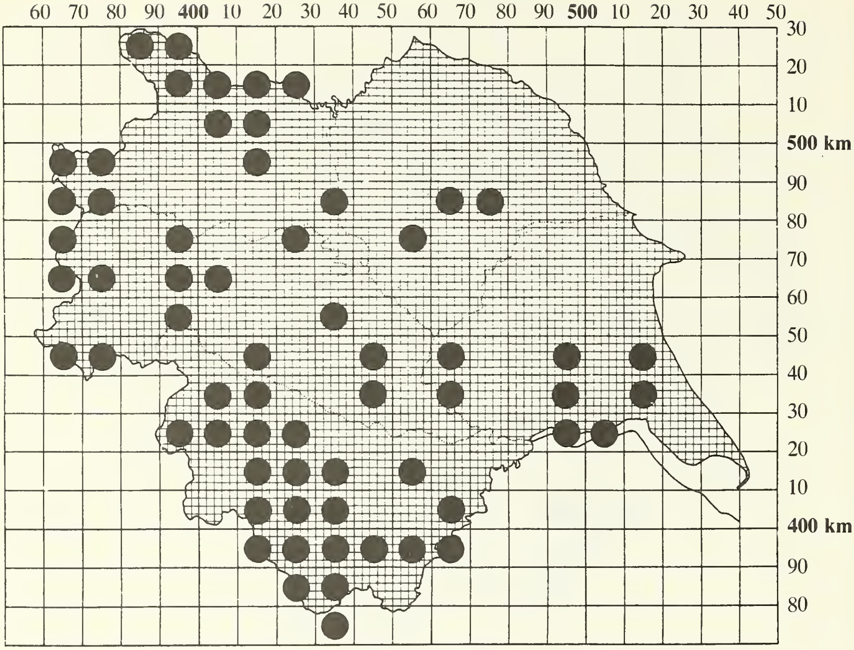
Brown Hare *Lepus capensis* L.



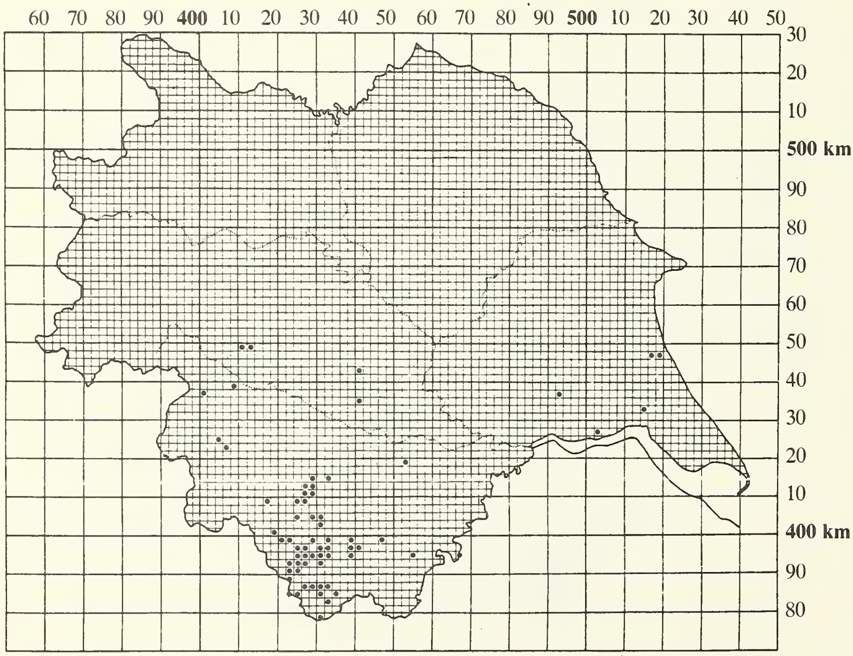


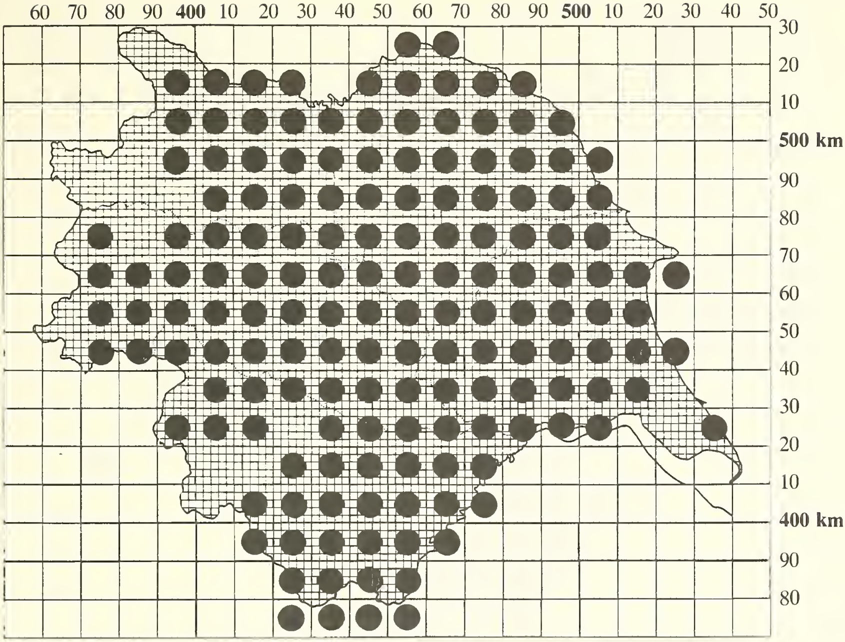
Mountain Hare *Lepus timidus* L.



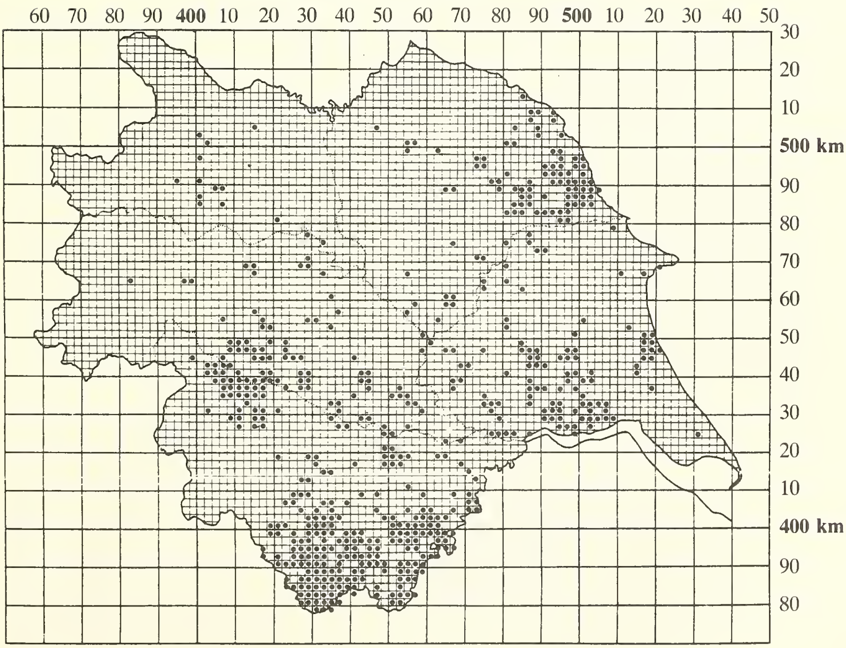


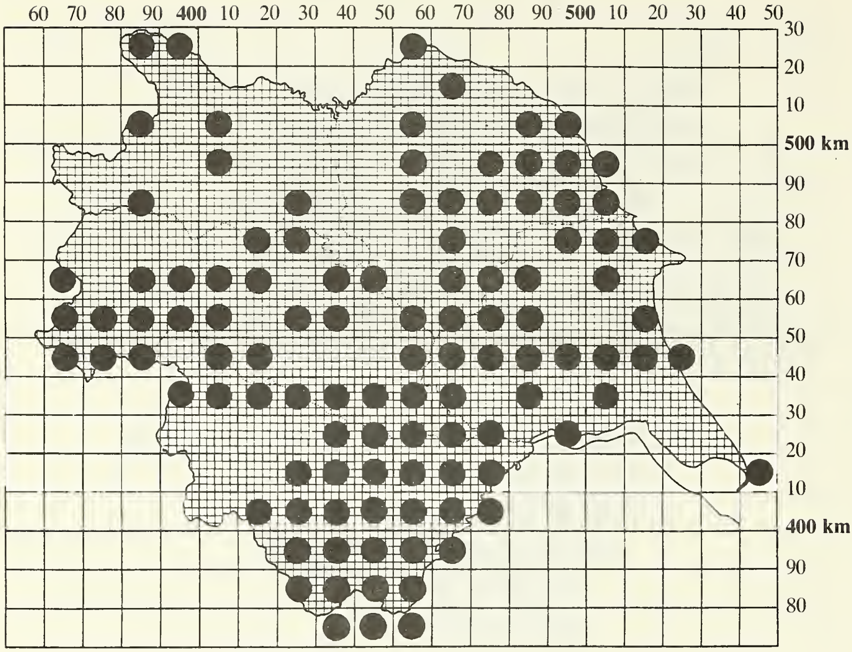
Red Squirrel *Sciurus vulgaris* L.



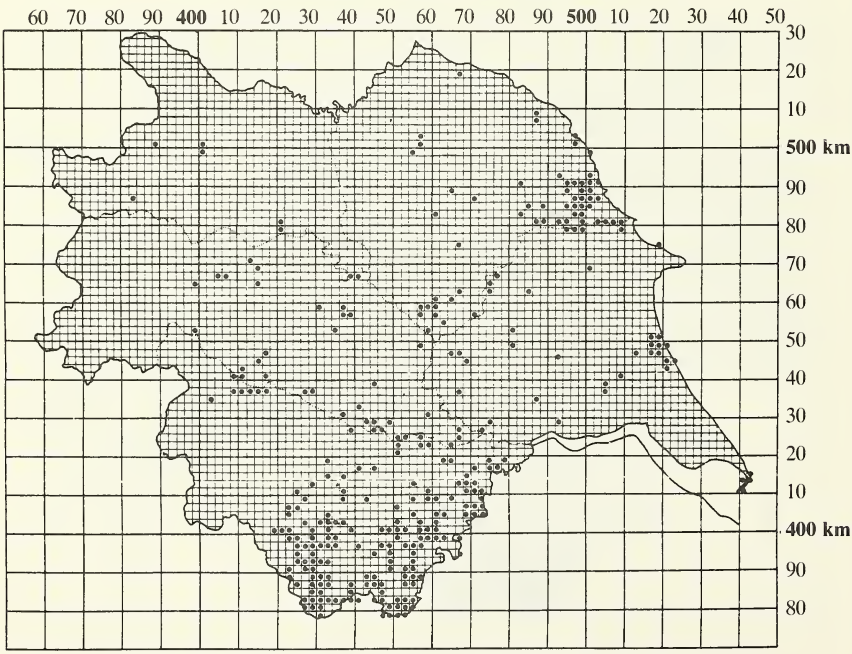


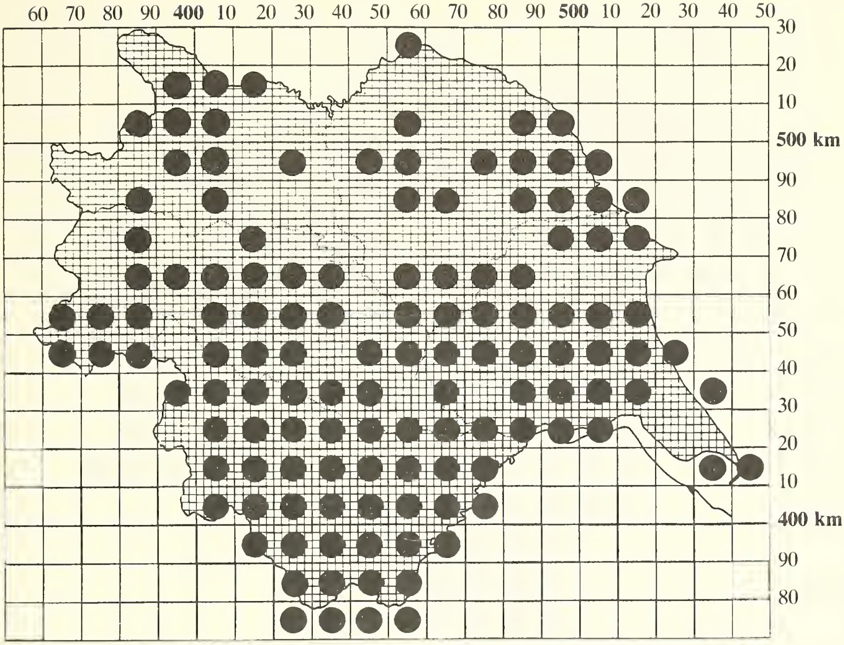
Grey Squirrel *Sciurus carolinensis* Gmelin



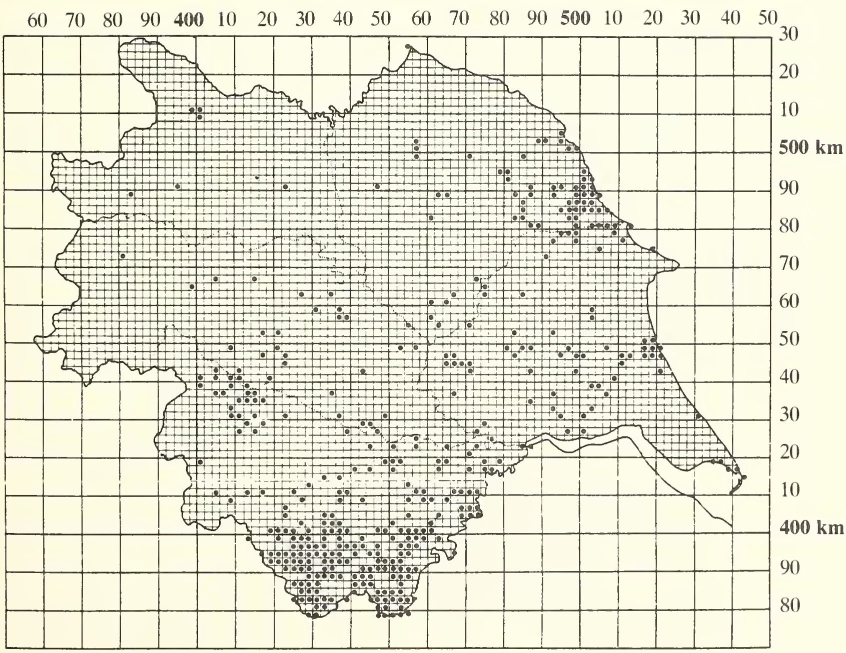


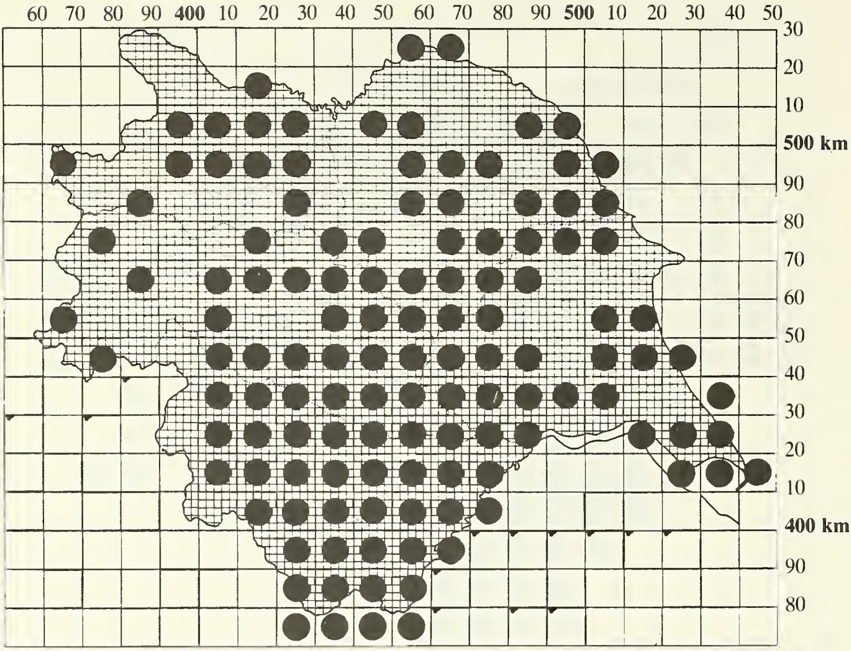
Bank Vole *Clethrionomys glareolus* (Schr.)



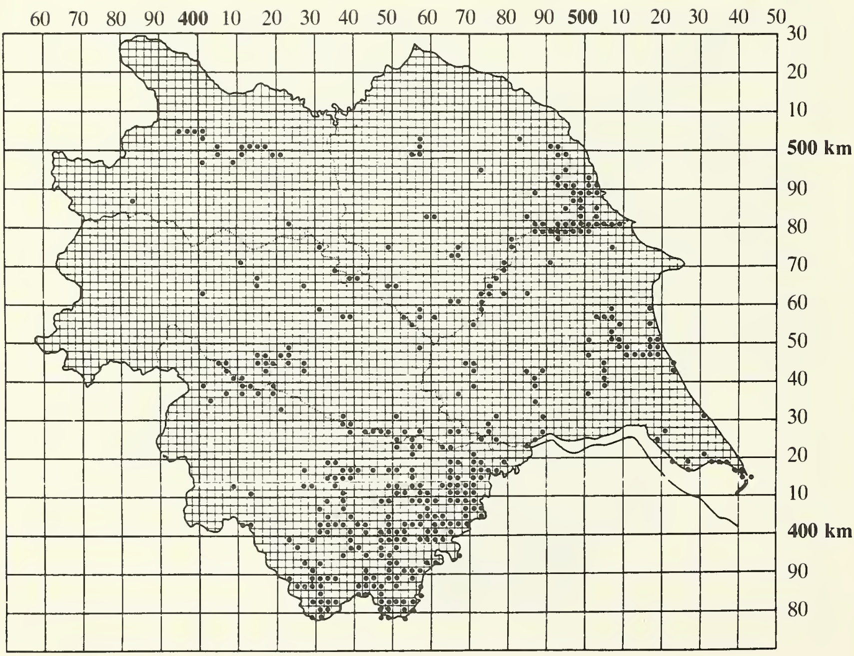


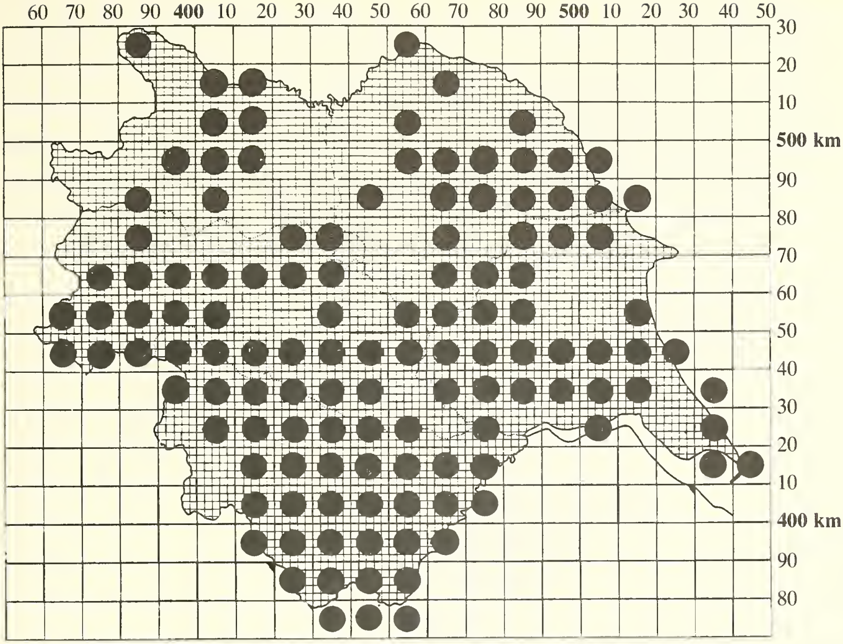
Field Vole *Microtus agrestis* (L.)



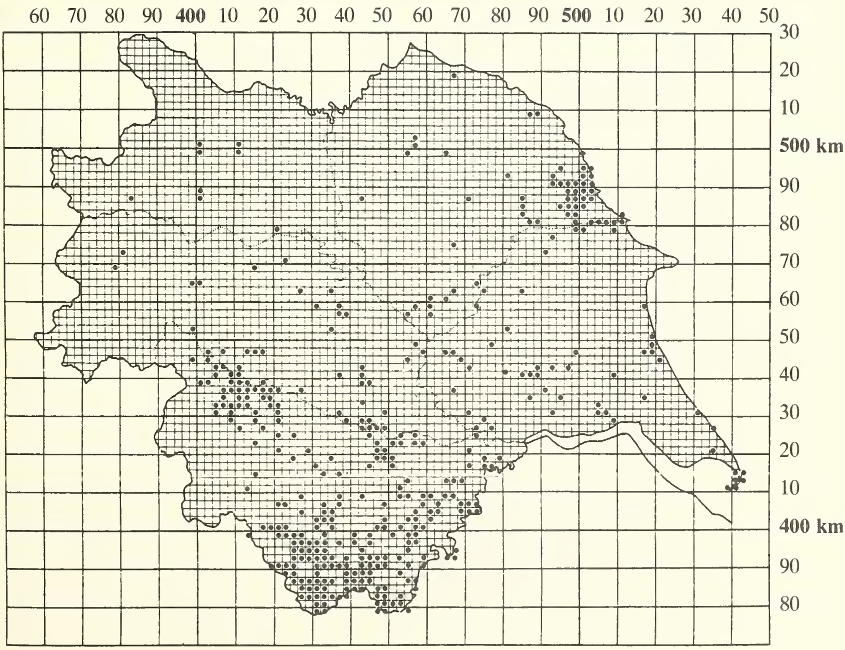


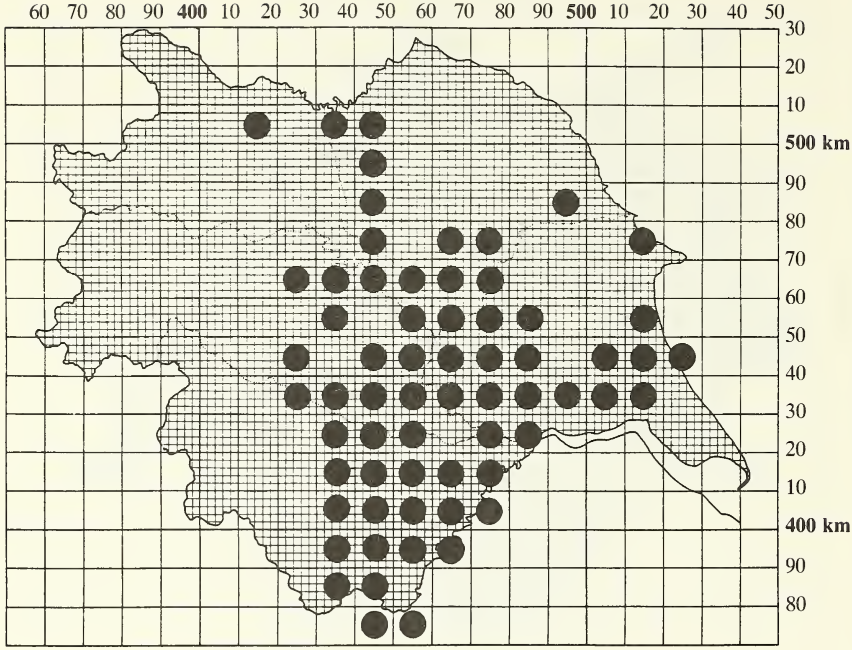
Water Vole *Arvicola terrestris* (L.)



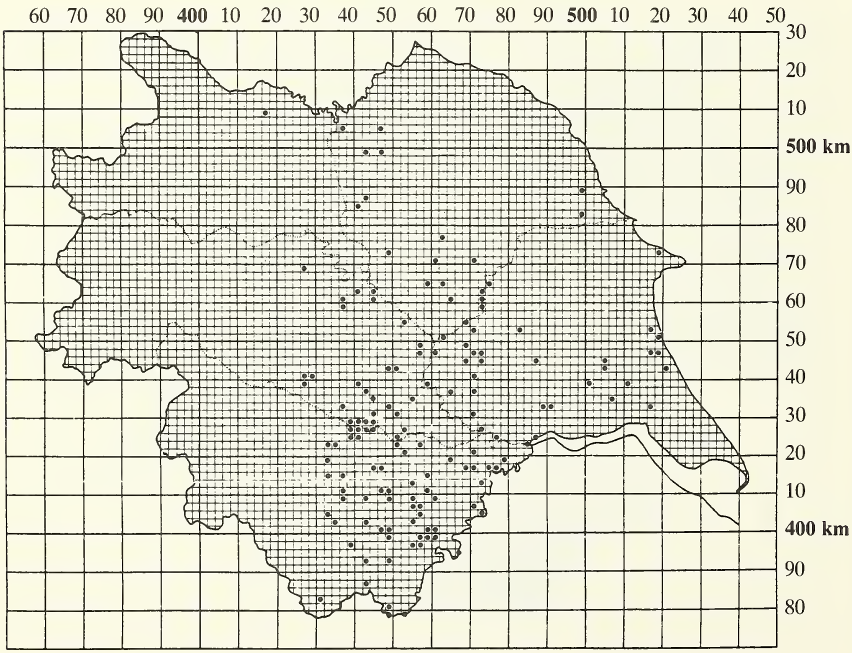


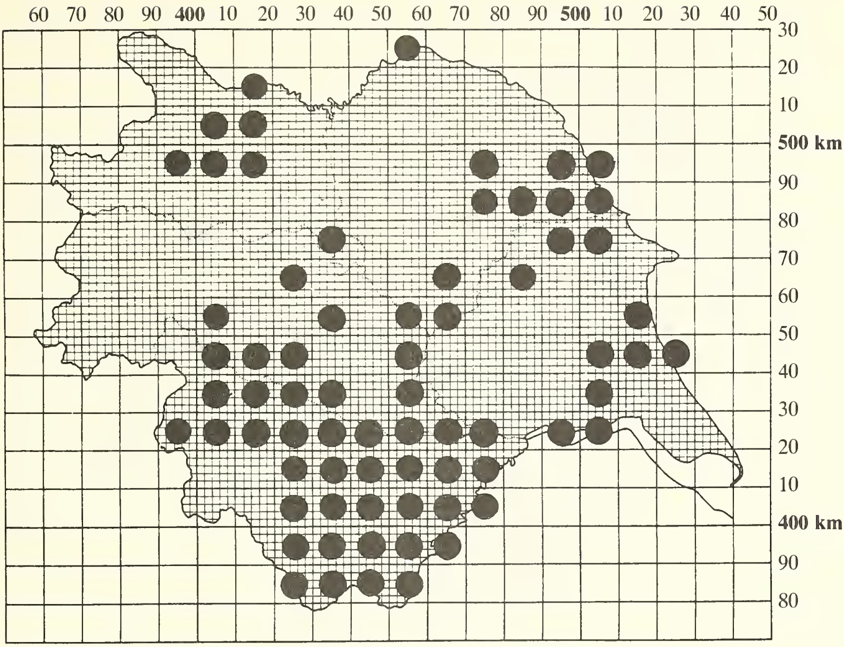
Wood Mouse *Apodemus sylvaticus* (L.)



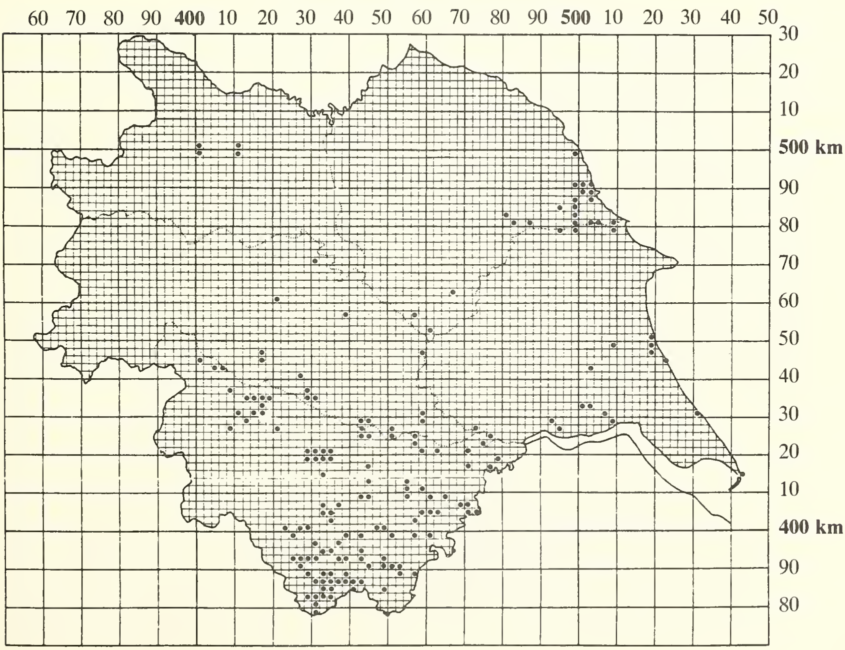


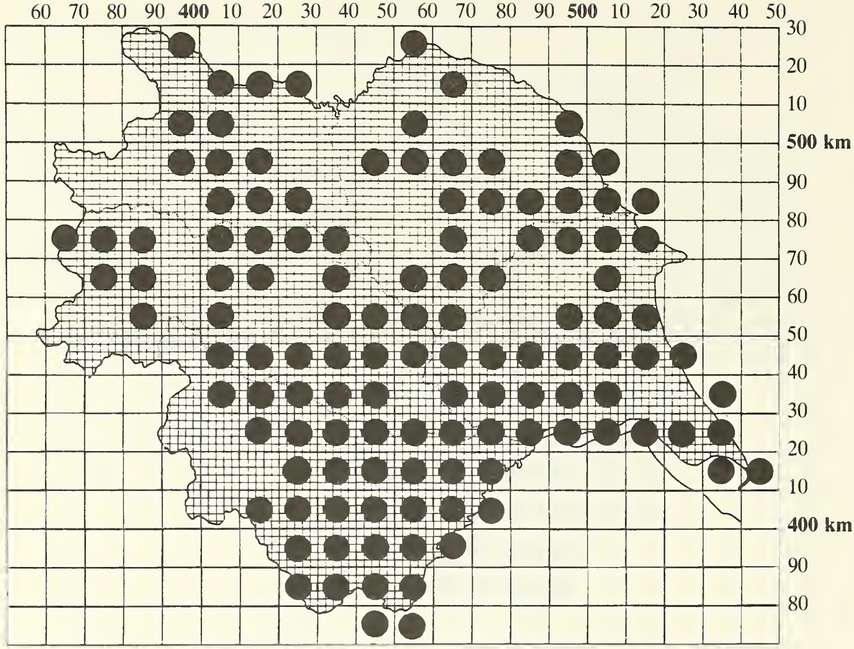
Harvest Mouse *Micromys minutus* (Pallas)



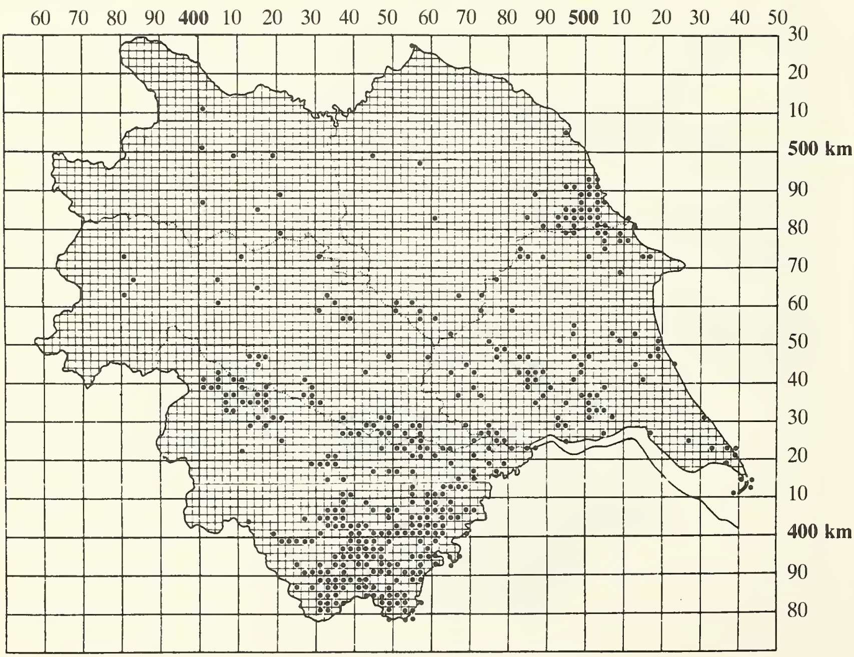


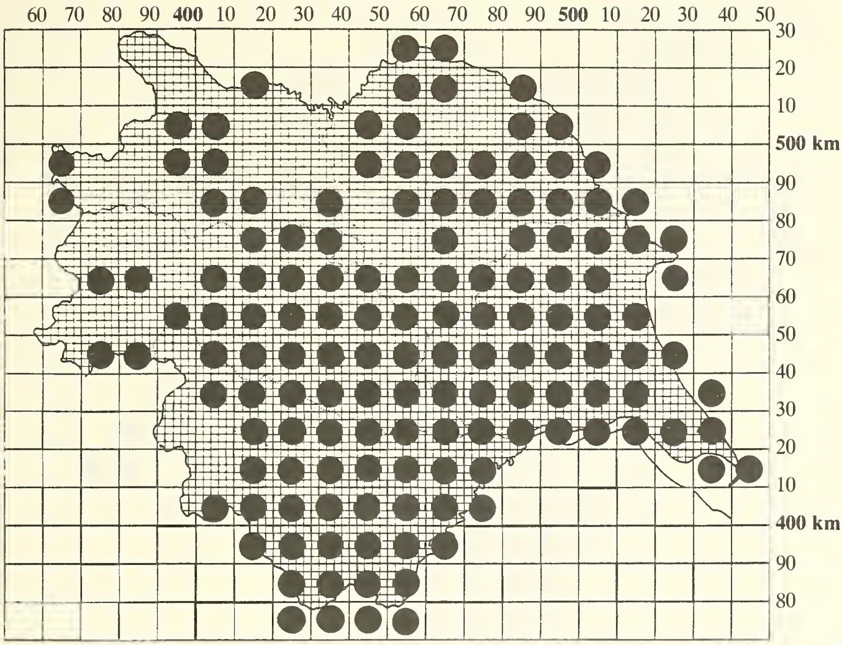
House Mouse *Mus musculus* L.



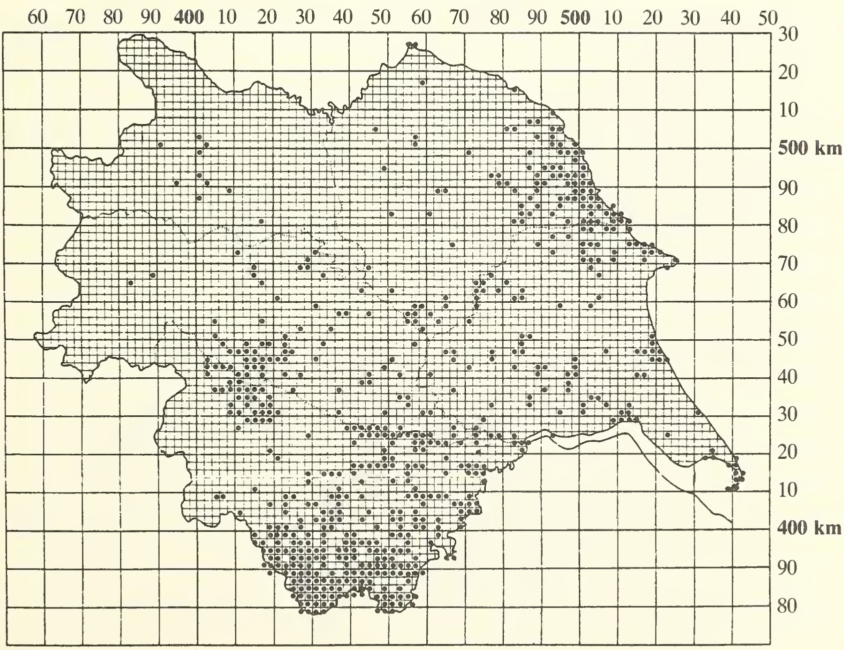


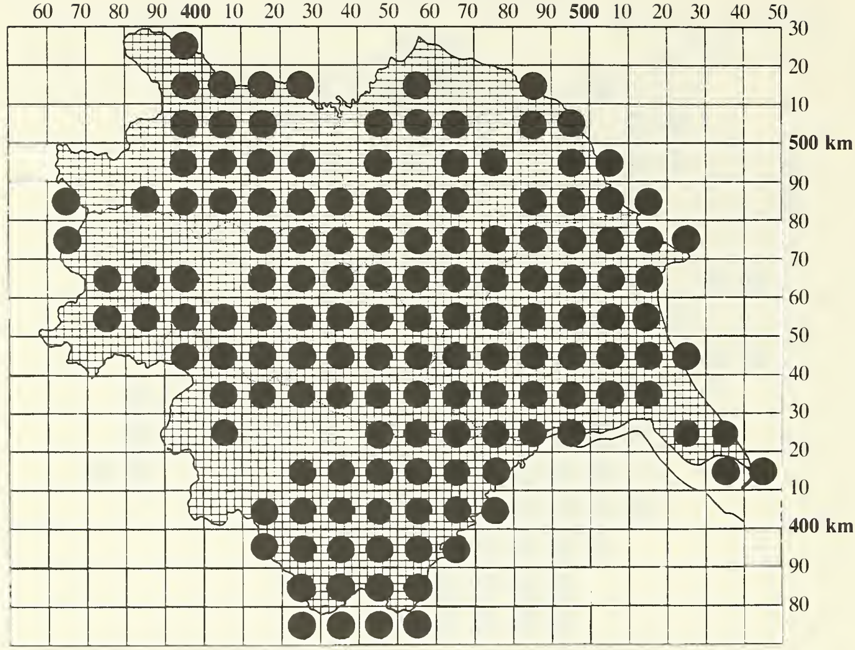
Common Rat *Rattus norvegicus* (Berkenhout)



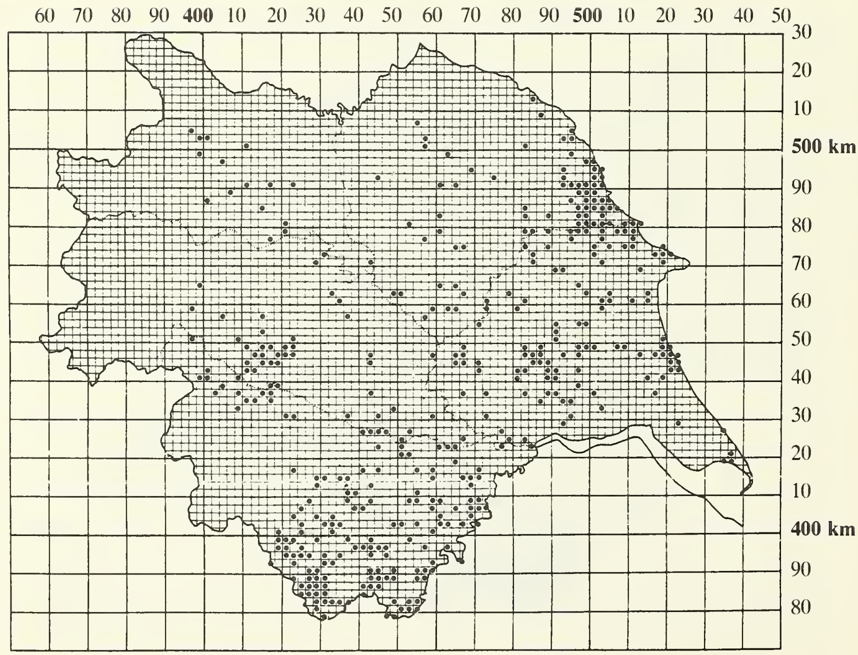


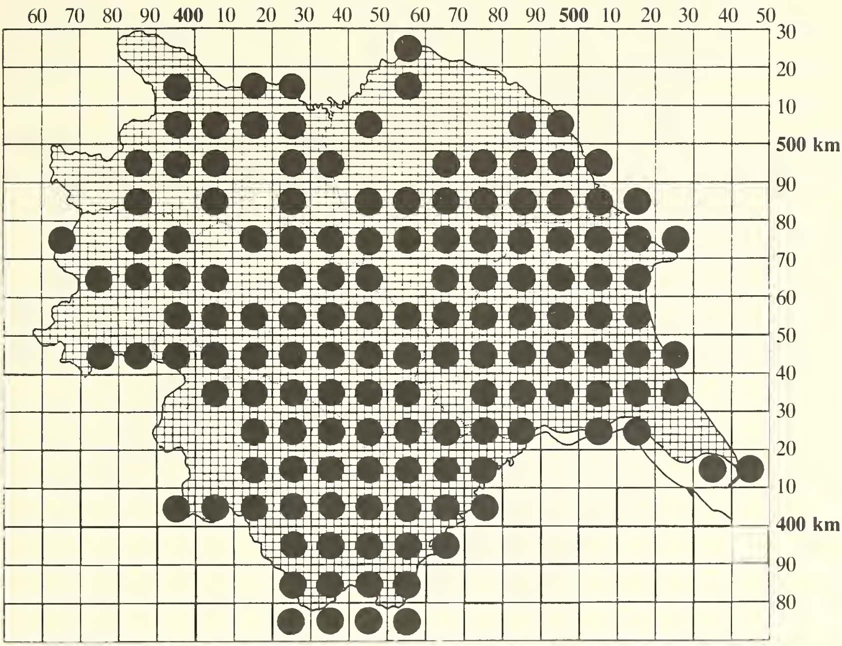
Fox *Vulpes vulpes* (L.)



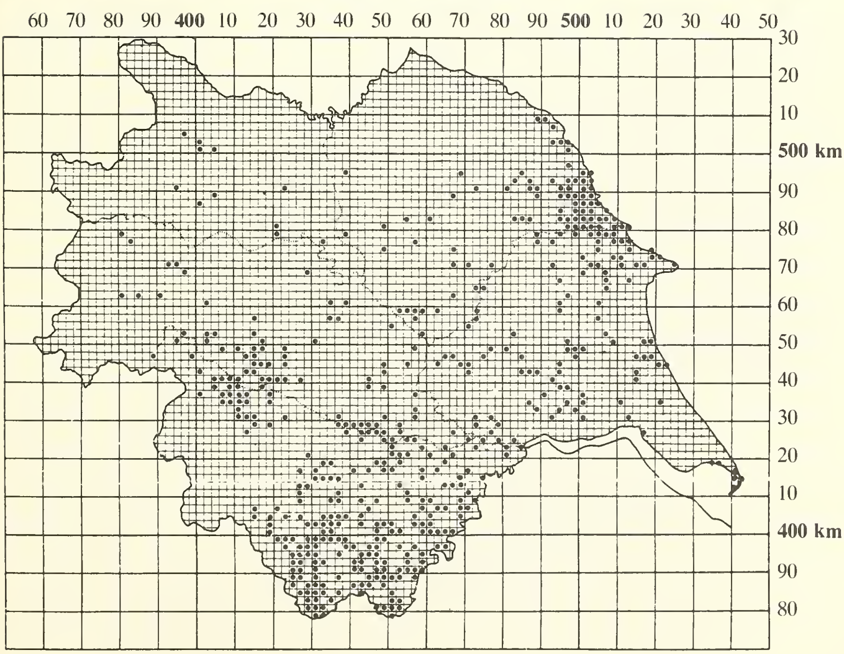


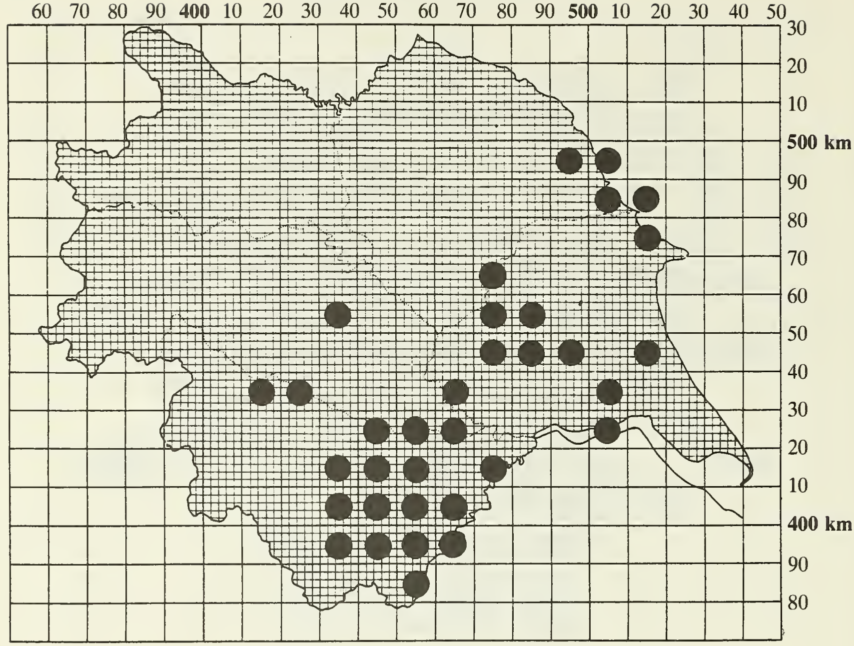
Stoat *Mustela erminea* L.



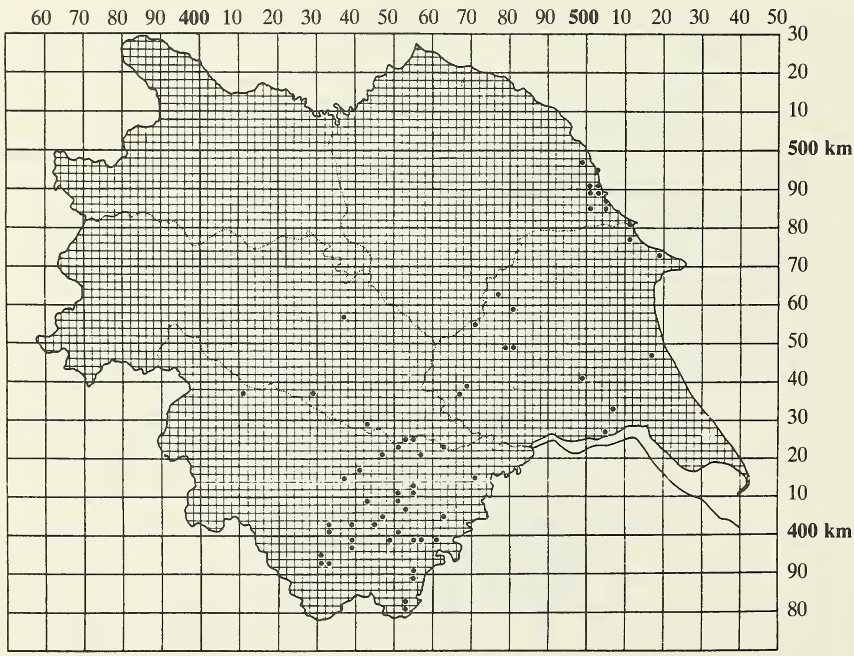


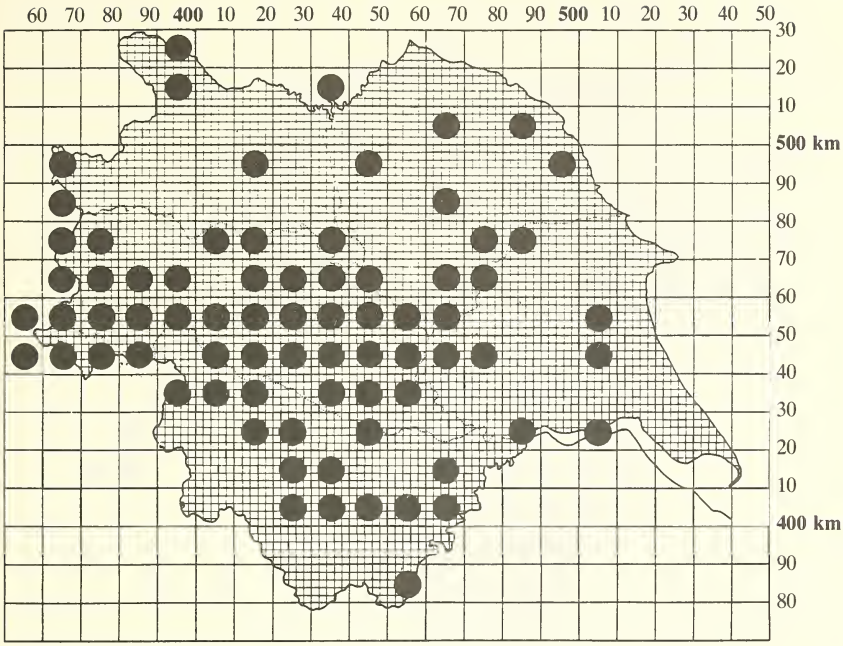
Weasel *Mustela nivalis* L.



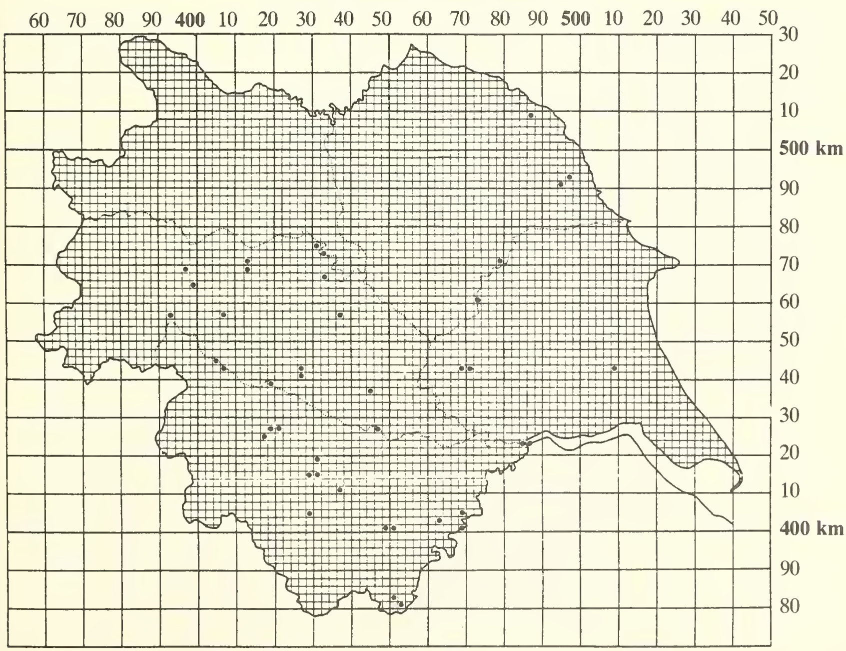


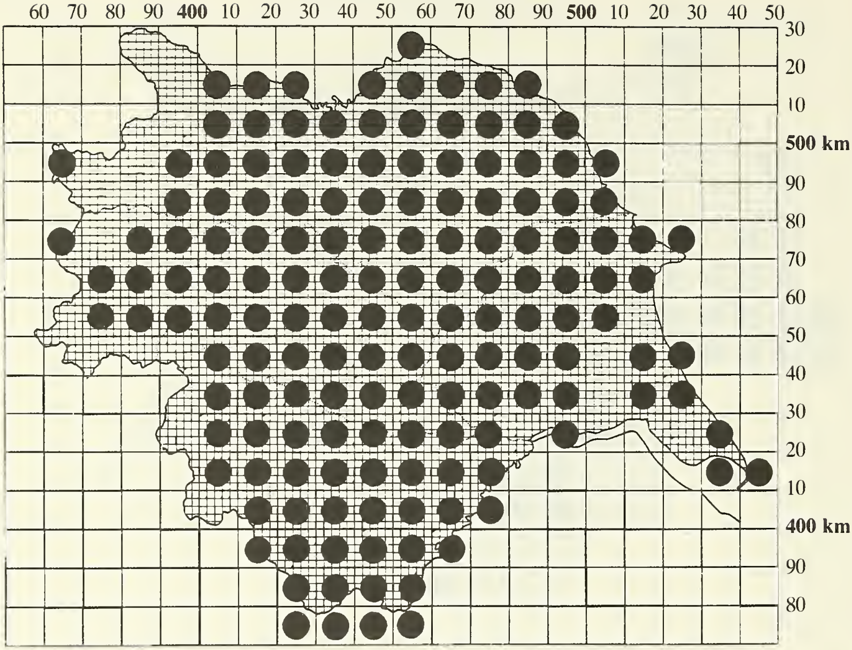
Ferret *Mustela furo* L.



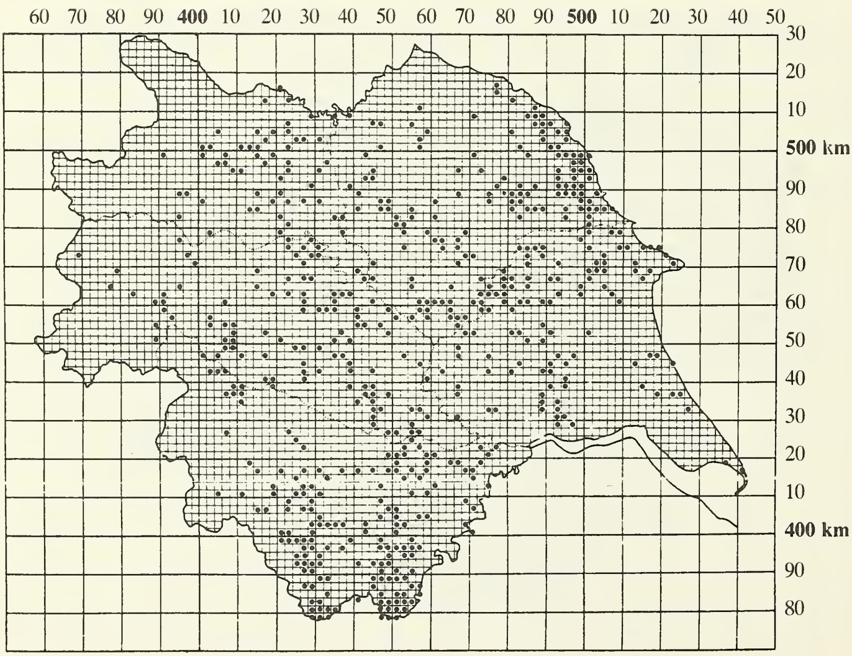


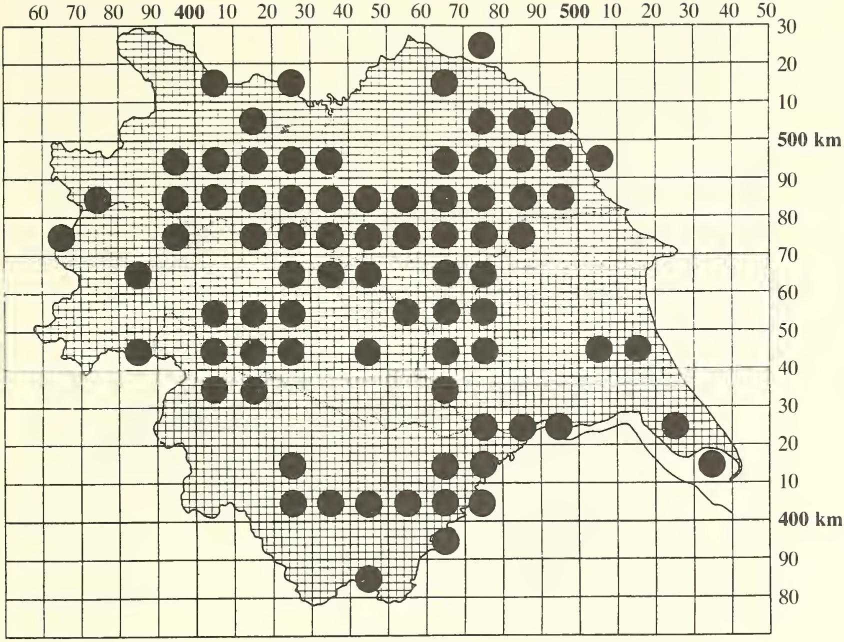
American Mink *Mustela vison* Schr.



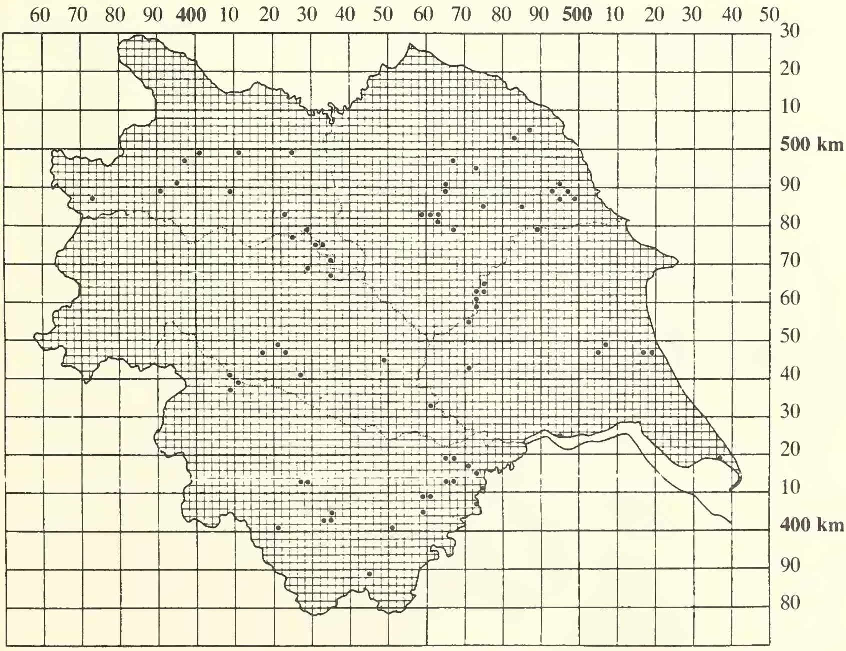


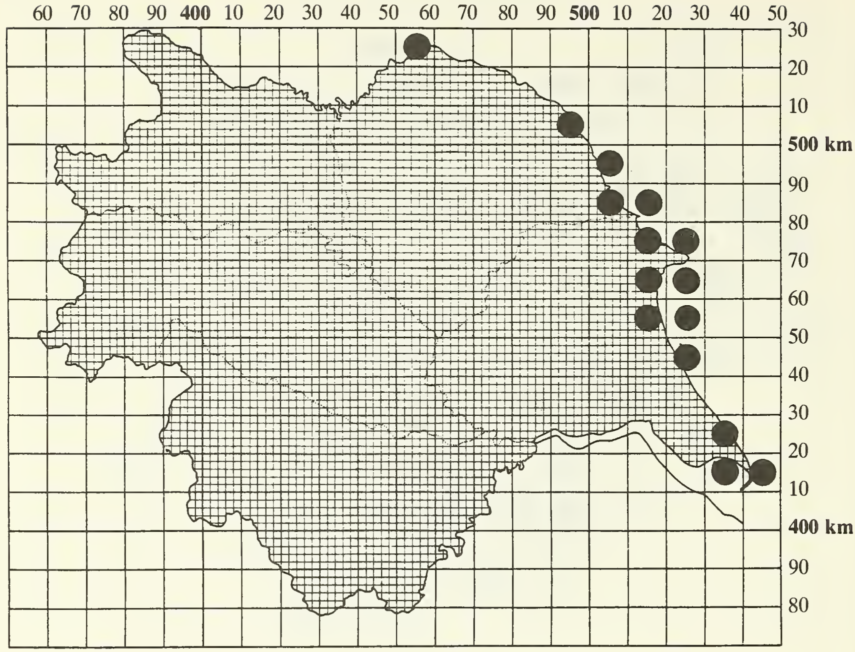
Badger *Meles meles* (L.)



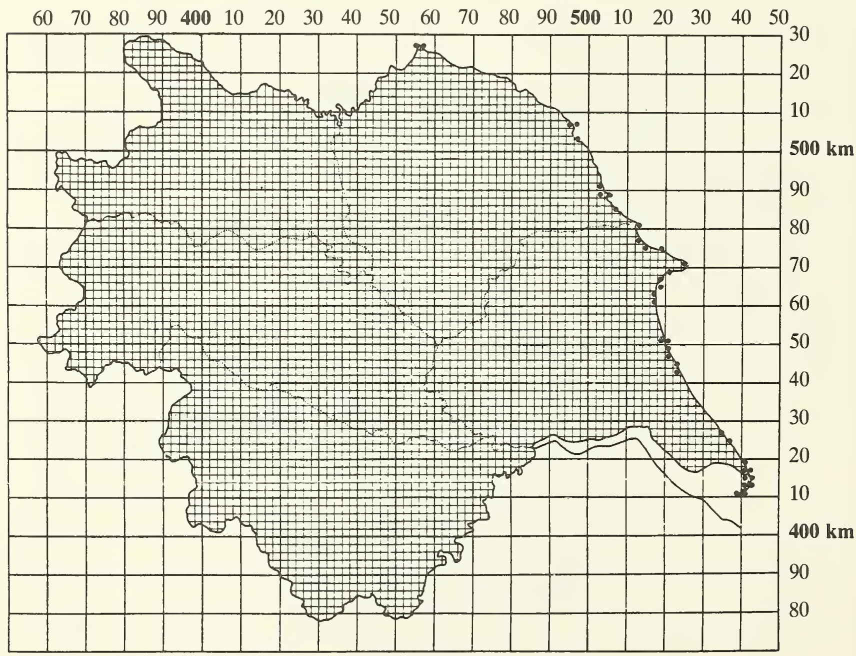


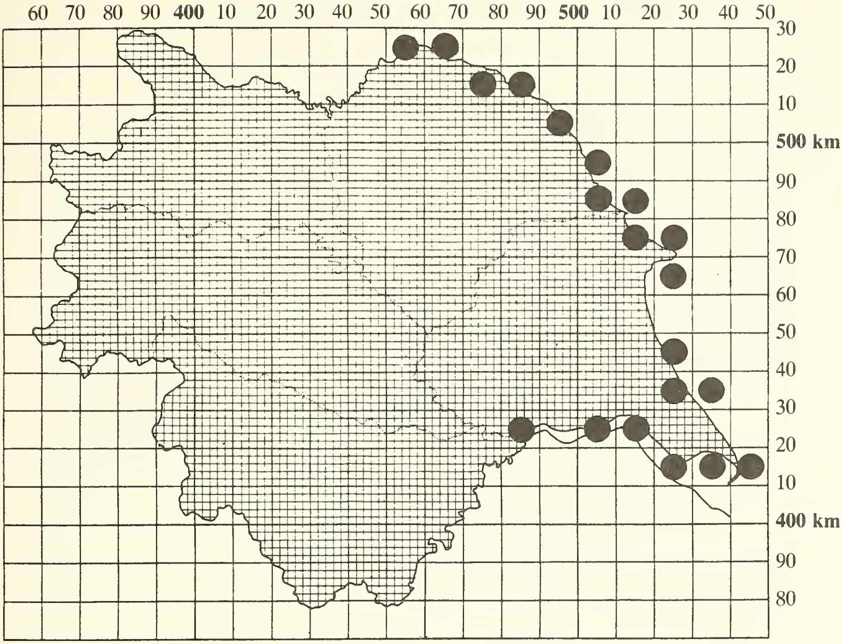
Otter *Lutra lutra* (L.)



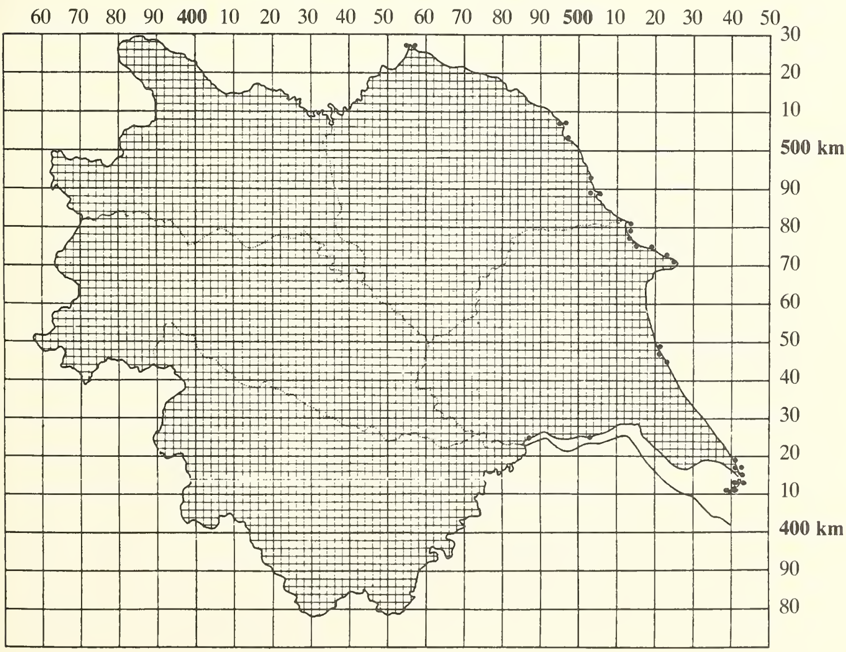


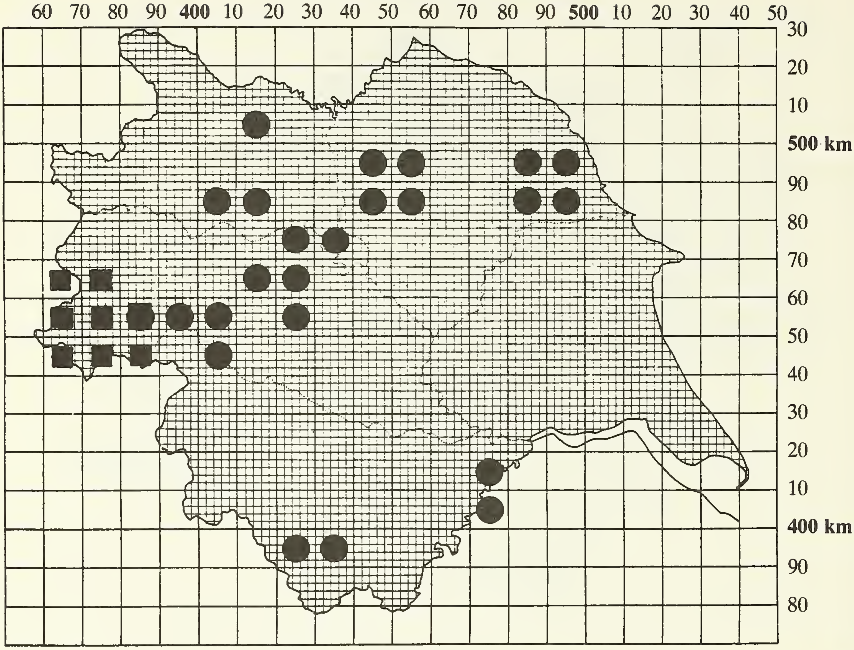
Common Seal *Phoca vitulina* L.



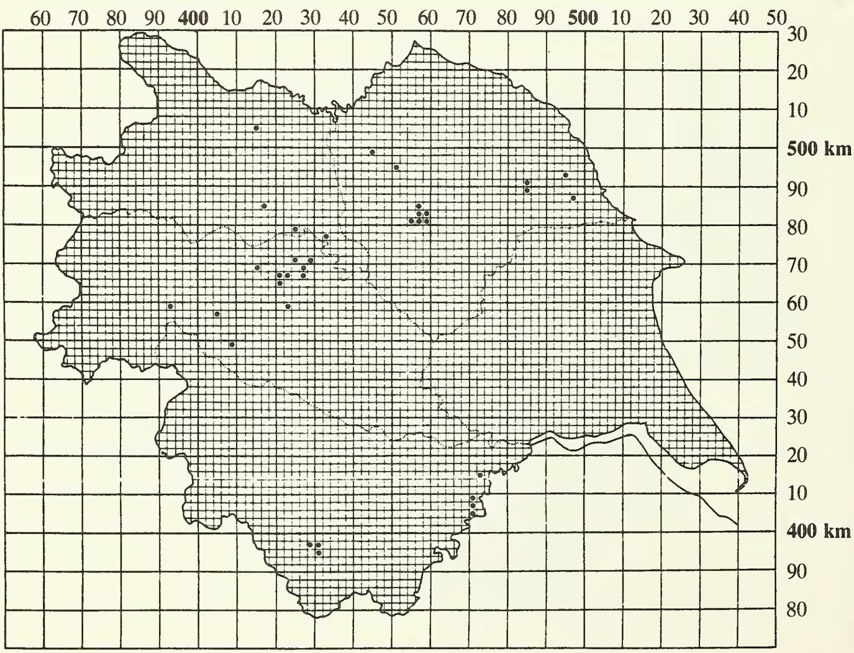


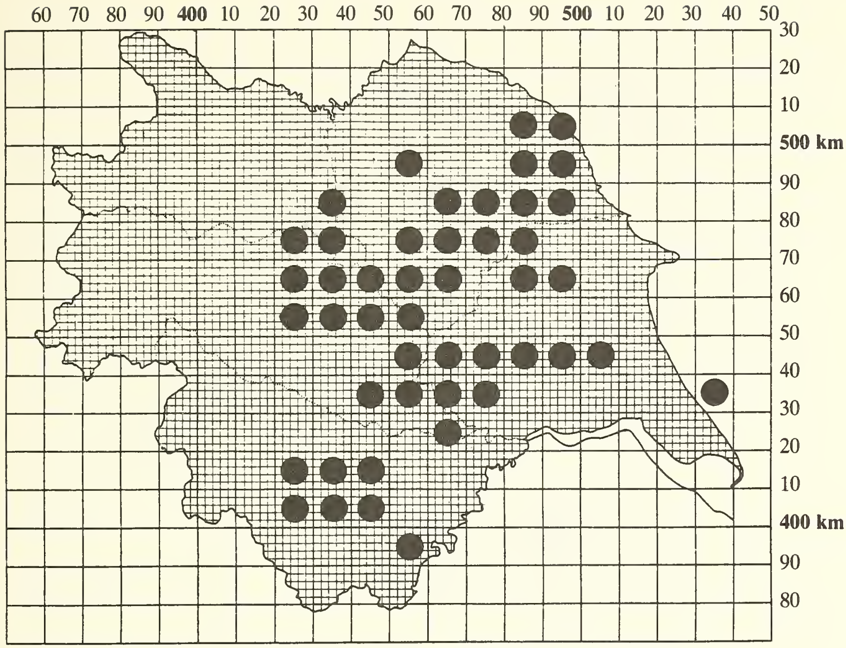
Grey Seal *Halichoerus grypus* (Fab.)



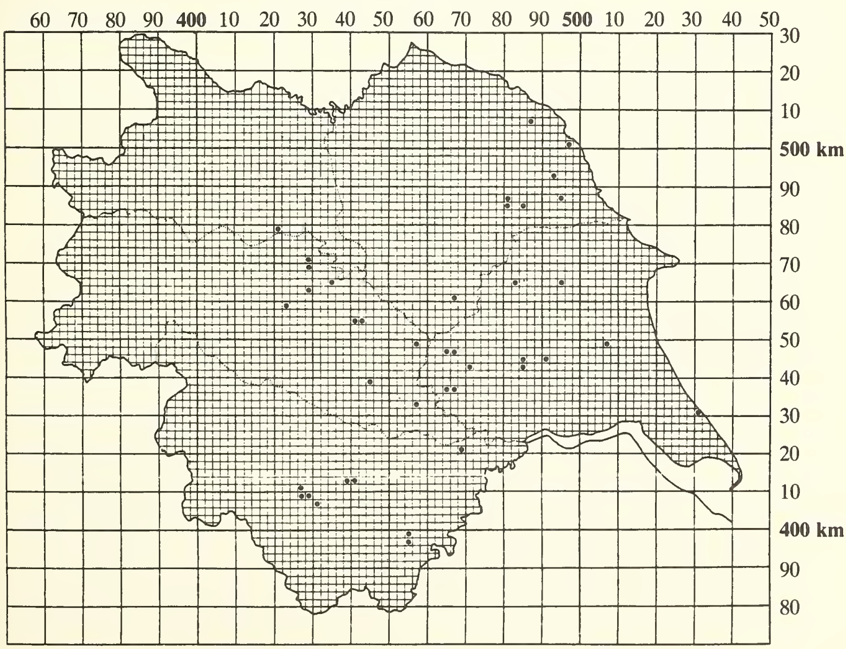


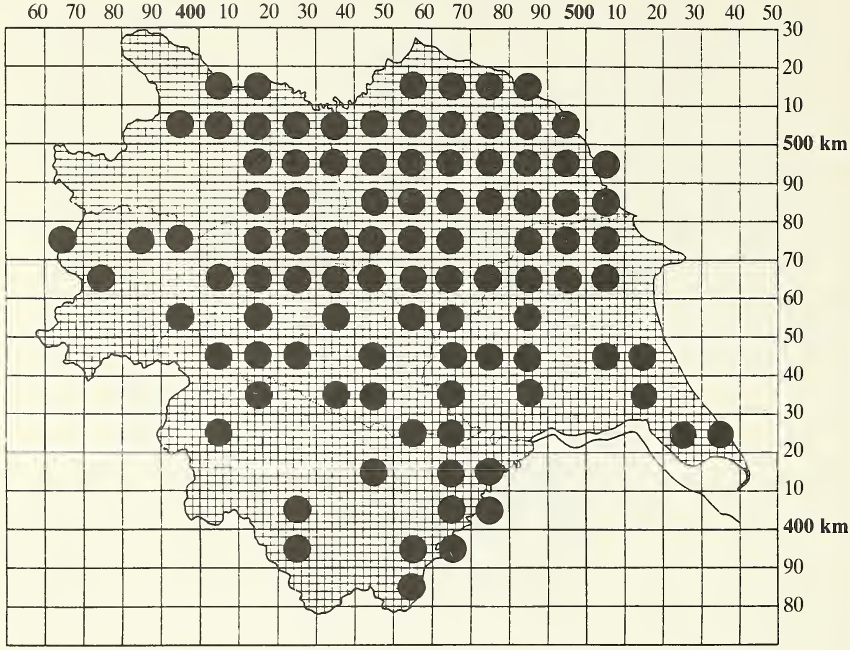
Red Deer *Cervus elaphus* L. = ● Sika Deer *C. nippon* Temminck = ■



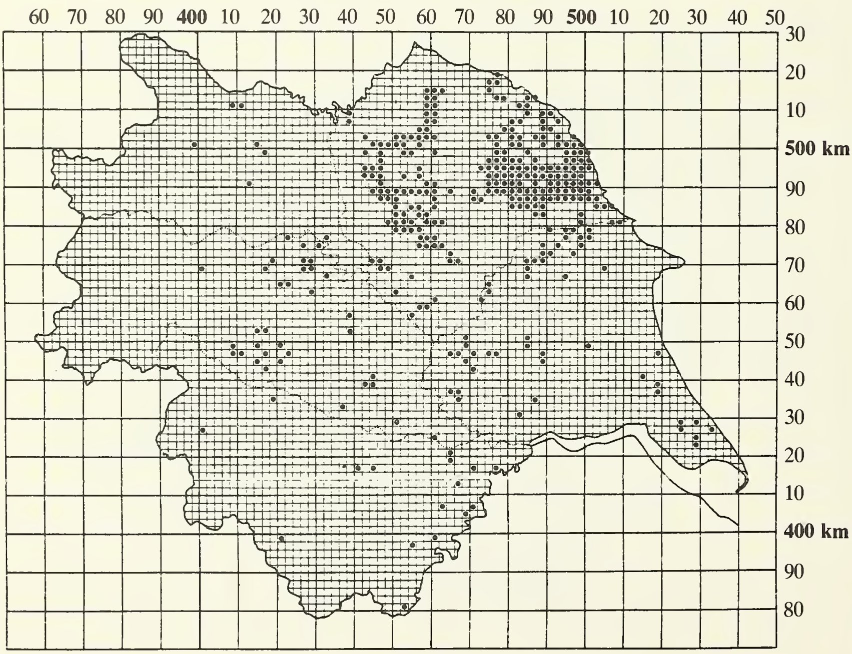


Fallow Deer *Dama dama* (L.)





Roe Deer *Capreolus capreolus* (L.)



BOOK REVIEWS

Mammal Ecology by **M. J. Delany**. Pp. 162, with 61 figures, 22 tables. Blackie. 1982. £8.50.
This book must be considered a welcome addition to the Tertiary Level Biology series produced by Blackie. Mammal Ecology presents the basic facts, recent advances and current problems in the field of mammalian ecology, and is packed with appropriate examples taken from the important literature of mammalogy and from the author's own extensive experience with African and British mammals. The result is a concise fact-filled summary of an intriguing area of science in a compact 145 pages of text. It begins with a 3-page table summarizing the common names of mammalian families of the entire world and the general distribution of each. In addition to distribution, the eight chapters cover the major topics of life history, populations, energetics of populations, niche, species diversity, and social organization, with one devoted to examples of practical problems such as game utilization, whale conservation and rabies. There is an extensive bibliography and a separate list of the most important journals in the field. Nearly all of the figures are clear examples that supplement the text well.

Dealing with a group of animals that contains members both beautiful and complex, as well as including the closest relatives of man, this book is certain to be of wide general interest as well as serving the need for a basic reference handbook.

NRF

Rats by **Martin Hart**. Pp. 172, with 50 photographs/drawings and 12 tables. Allison and Busby. 1982. £8.95.
In this book Martin Hart sets out to persuade us that rats (particularly *Rattus*) are intelligent and interesting animals, not the monsters that many people believe. He is a 'scientist' trying to reach 'the general reader' and his book is a mixture of fact and fable. There are chapters on the rat in myth and legend, classification and evolution, rat 'kings', behaviour, ecology, and rat control.

Although generally well written and informative, the text sometimes becomes repetitive in pursuit of a point, and makes many references to authors of whom 'the general reader' is very unlikely to have heard. This turns out to be equally frustrating to 'the scientist' as most of them do not appear in the bibliography! Many of the tables also present a level of detail which would only be of interest to a serious researcher and thus seem rather out of place in a book of this kind.

The author's personal involvement with rats has mainly been in the study of their behaviour in the laboratory and this is reflected in the book. The section on the behaviour of the brown rat is detailed, informed, interesting, and well illustrated, and would make useful background reading for students of ethology. The main point of the book — that man is responsible for the pest status of the rat, and should not therefore blame him for being what he is — also comes across well.

RHM

Hunting and Stalking Deer Throughout the World by **G. Kenneth Whitehead**. Pp. 336 (including numerous text figures), plus 32 pages b/w plates. Batsford. 1982. £15.
Deer hunting and stalking has a wide following throughout the world. In this book the author brings together, country by country, available facilities. Each species is dealt with individually with data provided on distribution, hunting regulations, facilities, costs, size of animals, natural history, numbers, and favoured localities. All this is lucidly written and greatly enhanced by Kenneth Whitehead's personal hunting experience in many of the localities he describes. In short this is a compendium of information on deer of considerable value to the international hunter. The book is completed by the inclusion of chapters on the hunting of exotics and the measurements of antlers and trophy awards. The account is well illustrated with distribution maps, drawings demonstrating the methods of measuring antlers for trophies and numerous monochrome plates.

With prices ever subject to change, it is unfortunate that for such a volume with a prospective long-term usefulness, that the costings will inevitably soon become outdated.

The primary appeal of this book is to the field sportsman although tucked within its covers there is much of value to the natural historian.

MJD

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THE INFLUENCE OF CASCADED LOCKS ON MACROINVERTEBRATE COMMUNITIES IN THE DISUSED HUDDERSFIELD NARROW CANAL

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Introduction

There have been few detailed studies of the ecology of canals in the UK. Most have described relationships between macrophyte growth, herbicide application and boat traffic (eg Murphy *et al.*, 1981; Murphy & Eaton, 1982) although Hanbury *et al.* (1981) described the effects on macroinvertebrates of herbicide application to four British Waterways Board canals.

By contrast, aspects of the ecology of the Huddersfield Narrow Canal have been the subjects of several publications. These have either recorded the presence of single species (eg Fryer, 1950; 1952; 1954; 1955) or have described the distributions of selected taxonomic groups which show evidence of longitudinal zonation (Watkin & Morphy, 1976; Morphy *et al.*, 1977, 1980). No attempts have been made to investigate localized spatial changes in the macroinvertebrate community, particularly in relation to cascaded locks. Many such structures — concrete step-weirs which accommodate waterfalls in place of the old locks — have been built since the canal was closed to navigation in 1944. Investigations of the ecological influences of these and other water engineering structures are rare in the literature.

Study Area

Four cascaded locks, over a distance of 1.75 km (SE 087 143 to SE 102 152) and denoted A to D, were intensively studied: these are shown respectively as numbers 19,18, 15 and 13 in maps provided by Watkin and Morphy (1976). Dissolved oxygen concentrations were studied at a further weired lock (69 in Watkin & Morphy, 1976).

During normal flows, water depths are 10–30 cm immediately below cascades, increasing to 10 cm — 2 m further downstream. Current velocities change accordingly from 20 — 80 cm s^{-1} below cascades to less than 5 cm s^{-1}.

Methods

Seven stations (1 to 7) were investigated at each of locks A to D, each station being identifiable by a lock letter and a station number (A1 to A7; B1 to B7 etc). Stations 1 and 2 were respectively 25 m and 1 m upstream of the cascades and stations 3, 4, 5, 6 and 7 were respectively 1, 5, 10, 25 and 50 metres downstream (Fig. 1).

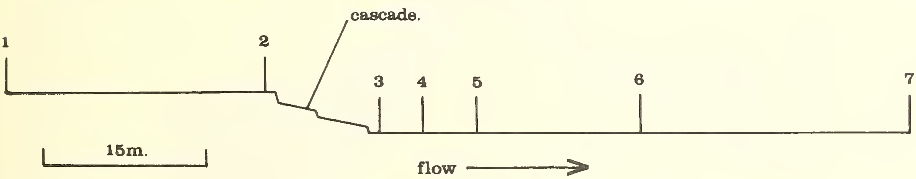

FIGURE 1
Diagrammatic representation of sampling station positions.

Physico-chemical factors

Samples of the canal bed (500–1000 g) were removed in March 1980, from each station by a simple scoop. The percentage contribution (by weight) of each sample by gravel (> 2.0 mm particle diameter), coarse sand (2.0 — 0.2 mm), fine sand (0.2 — 0.02 mm) and silt and clay (< 0.02 mm) was estimated using a standardized procedure of sieving and settlement in deionized water.

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Oxygen concentrations were determined at each station on one day in March 1980, and over a period of twenty-two hours from 0500 on 5 August 1981, at stations 5 m upstream and downstream of lock 69 by the Winkler method (Mackereth *et al.*, 1978) on samples collected using a 'Labcol' water sampler.

Macroinvertebrates

All the biological sampling was undertaken between January and March 1980. Following earlier studies (Watkin & Morphy, 1976; Morphy *et al.*, 1977), macroinvertebrates were collected in a Freshwater Biological Association hand net (mesh size 1 mm), swept through a 1 m length of the canal bottom at each station. At stations 3, 4 and 5, this involved some kick sampling of the coarser substratum. Samples were fixed in 4 per cent formalin and taken to the laboratory. Coarse organic debris was removed by sieving, and each sample was sorted under a low power binocular microscope. Where possible, identification was to species.

Results

Physico-chemical

Results from particle size analysis indicated that, generally, coarser particles predominated in samples immediately upstream of and downstream from the cascade, whilst finer particles formed increasingly higher proportions of samples collected further downstream or 25 m upstream (Fig. 2). The large standard deviation and high mean percentage of gravel for station 2 resulted from the large (93 per cent) proportion of this fraction at C2. By contrast, A2 had only 10 per cent gravel. In addition, larger particles (50–500 mm) than those sampled formed an important component of the substratum at stations 3 and 4.

During March 1980, oxygen concentrations at every station exceeded 95 per cent saturation (11.5–12.5 mg 0_2 1^{-1}). However, results from August 1981, illustrated a clear diel pattern with peak oxygen concentrations of almost 100 per cent saturation (8.5–9.0 mg 0_2 1^{-1}) during the afternoon both upstream and downstream (Fig. 3). Concentrations downstream markedly exceeded those upstream and corresponding values for each hour (except 1200–1900) have been plotted (Fig. 4) to give a re-aeration coefficient for the weir (Gameson, 1957). The downstream values in Fig. 3 have been corrected using the derived relationship.

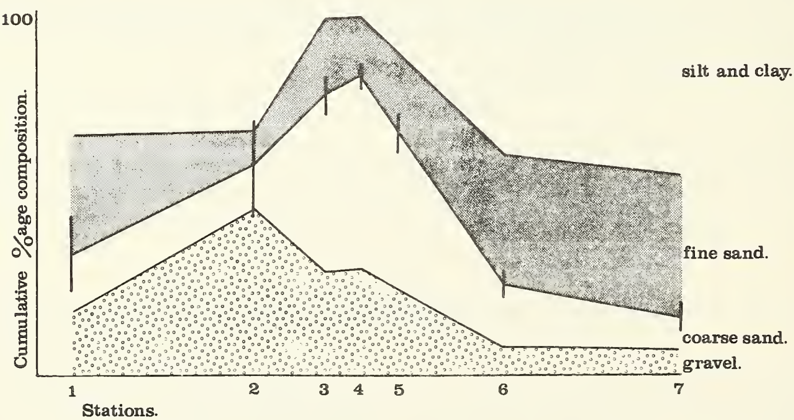

FIGURE 2

Particle compositions of samples of the canal bed. The points joined are the arithmetic mean percentage of each fraction from the four locks. The vertical lines are the standard deviations of the mean combined percentages of gravel and coarse sand.

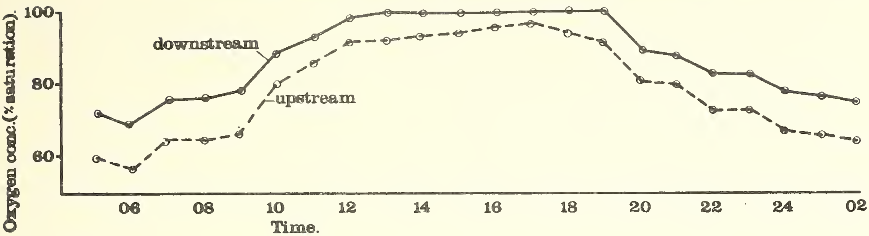

FIGURE 3

Diel changes in oxygen concentration upstream and downstream of lock 69, 5–6 August 1981. The downstream values have been corrected using the relationship derived in Fig. 4.

Macroinvertebrates

Whilst some species were almost or wholly ubiquitous (eg *Asellus aquaticus, Crangonyx pseudogracilis, Potamopyrgus jenkinsi*), others were restricted to stations immediately downstream of the cascades (Table 1). These included *Baetis rhodani* (which provided 10–15 per cent of the animals collected from stations 3 and 4), *Simulium ornatum* (15–20 per cent), *Hydropsyche angustipennis* (2–3 per cent) and, at three of the four locks, *Polycelis felina* (10–30 per cent) and *Rhyacophila dorsalis* (1–2 per cent). Conversely, *Sialis lutaria* was absent from these stations, though it occurred widely elsewhere. Some species were present only at the downstream locks (eg *Physa* sp.). Overall, more taxa were recorded at the stations immediately below cascaded locks (Table 2) than at all other stations (Mann-Whitney $u = 0.5$, $d = 3.118$, $p = 0.01$).

Table 3 shows similarity coefficients (Mountford, 1962) between stations, based on the taxa present, as averages for locks A, B and D. The corresponding dendrogram is shown in Fig. 5(a). Lock C was atypical and has been treated separately (Fig. 5b). At locks A, B and D, the stations immediately below cascades had similar communities and clustered together; similarly, stations 1, 2, 5, 6 and 7 clustered together. At lock C, the pattern was less clear, although C3 was again isolated. In similarity comparisons between all twenty-eight stations, stations 3 and 4 from different locks had higher similarity coefficients (eg A3 — D3 = 0.371; A4 — D4 = 0.375; A4 — B4 = 0.411) than with different station numbers (eg A3 — D7 = 0.072; A4 — D2 = 0.108).

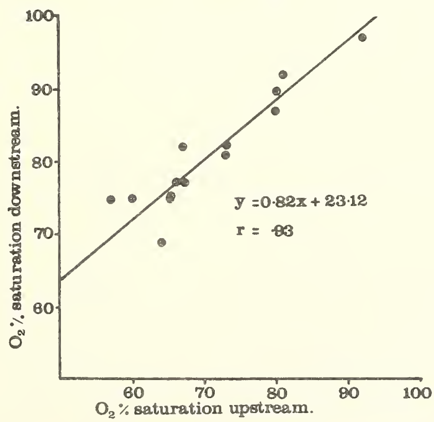

FIGURE 4

Oxygen concentrations (% saturation) upstream and downstream of lock 69 on 5–6 August (1981), plotted after Gameson (1957).

	A							B							C							D						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Oligochaetes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Erpobdella octoculata L.	*		*			*		*	*				*	*								*	*	*		*	*	
Pisidium spp	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Crangonyx pseudogracilis Bousfield	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*	*
Asellus aquaticus (L.)	*	*	*	*	*	*			*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*	*
Sialis lutaria (L.)	*	*			*		*	*	*			*	*	*	*				*	*		*	*			*	*	*
Chironomidae spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dytiscidae spp.	*	*																										
Potamopyrgus jenkinsi (Smith)		*				*	*	*	*	*	*	*	*		*			*	*	*	*		*	*	*	*	*	*
Polycles felina (Dalyell)			*	*						*	*	*												*	*			
Lymnaea peregra (Müll)			*																					*				
Baetis rhodani (Pictet)			*	*						*	*						*	*						*	*			
Halesus sp.			*	*				*					*															
Limnephilidae sp A			*		*				*						*					*	*			*	*			
Hydropsyche angustipennis (Curtis)			*							*							*							*				
Rhyacophila dorsalis (Curtis)			*							*														*				
Simulium ornatum Mg.			*							*	*						*							*	*			
Planorbarius corneus (L.)						*																						
Limnephilidae sp. B										*	*																	
Limnophora sp.										*														*				
Tipulidae sp.										*																		
Planorbis albus Mull															*						*				*			
Physa sp.															*			*	*	*	*	*				*	*	*
Austropotamobius pallipes (Lereboullet)															*		*											
Corixa sp.															*						*					*	*	*
Holocentropus dubius (Ramb.)																*												
Ancylus fluviatilis Müll																	*							*				
Gammarus pulex (L.)																	*											
Polycentropus flavomaculatus (Pictet)																	*											
Glossiphonia complanata (L.)																						*						
Sphaerium corneum (L.)																						*		*				
Piscicola geometra (L.)																								*				
Limnephilus rhombicus (L.)																								*				
Polycelis sp.																									*			
Hydracarina spp.																											*	

TABLE 1

The taxa recorded at each station (* denotes present). Nomenclature follows Maitland (1977).

	A							B							C							D						
	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7	1	2	3	4	5	6	7
Oligochaetes	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Erpobdella octoculata L.	*		*			*		*	*				*	*								*	*	*		*	*	
Pisidium spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Crangonyx pseudogracilis Bousfield	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*	*
Asellus aquaticus (L.)	*	*	*	*	*	*			*	*	*	*	*	*	*		*	*	*	*	*		*	*	*	*	*	*
Sialis lutaria (L.)	*	*			*		*	*	*			*	*	*	*				*	*		*	*			*	*	*
Chironomidae spp.	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*	*
Dytiscidae spp.	*	*																										
Potamopyrgus jenkinsi (Smith)		*				*	*	*	*	*	*	*	*		*			*	*	*	*		*	*	*	*	*	*
Polycles felina (Dalyell)			*	*						*	*	*												*	*			
Lymnaea peregra (Müll)			*																					*				
Baetis rhodani (Pictet)			*	*						*	*						*	*						*	*			
Halesus sp.			*	*				*					*															
Limnephilidae sp. A			*		*				*						*					*	*			*	*			
Hydropsyche angustipennis (Curtis)			*							*							*							*				
Rhyacophila dorsalis (Curtis)			*							*														*				
Simulium ornatum Mg.			*							*	*						*							*	*			
Planorbarius corneus (L.)						*																						
Limnephilidae sp. B										*	*																	
Limnophora sp.										*														*				
Tipulidae sp.										*																		
Planorbis albus Müll															*						*				*			
Physa sp.															*			*	*	*	*	*				*	*	*
Austropotamobius pallipes (Lereboullet)															*		*											
Corixa sp.															*						*					*	*	*
Holocentropus dubius (Ramb.)																*												
Ancylus fluviatilis Müll																	*							*				
Gammarus pulex (L.)																	*											
Polycentropus flavomaculatus (Pictet)																	*											
Glossiphonia complanata (L.)																						*						
Sphaerium corneum (L.)																						*		*				
Piscicola geometra (L.)																								*				
Limnephilus rhombicus (L.)																								*				
Polycelis sp.																									*			
Hydracarina spp.																											*	

TABLE 1
The taxa recorded at each station (* denotes present). Nomenclature follows Maitland (1977).

TABLE 2

Arithmetic mean numbers of taxa recorded from locks A to D derived directly from those listed in Table 1.

STATION	1	2	3	4	5	6	7
Mean number of taxa	8.25	7.25	14.25	9.25	8.25	9.25	8.0

TABLE 3

Coefficients of similarity (Mountford, 1962) between stations 1–7. The values are averages for locks A, B and D, and are based on the taxa listed in Table 1.

STATION	2	3	4	5	6	7
1	.628	.077	.157	.358	.817	.462
2	—	.087	.123	.478	.528	1.11
3	—	—	.348	.149	.102	.103
4	—	—	—	.263	.144	.194
5	—	—	—	—	1.39	.579
6	—	—	—	—	—	1.175
7	—	—	—	—	—	—

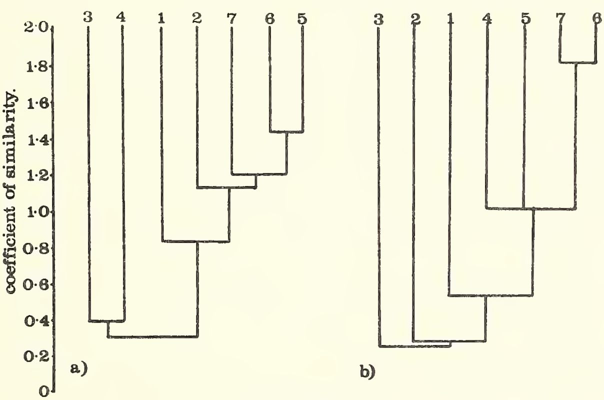

FIGURE 5

Single-linked cluster dendrograms of community similarity (Mountford, 1962). (a) Averages for locks A, B and D stations. (b) Lock C stations.

Discussion

It is clear that cascaded locks lead to marked physical changes in the Huddersfield Narrow Canal. These have major effects on the macroinvertebrate community, with *H. angustipennis, R. dorsalis, B. rhodani, Polycelis* spp. and *S. ornatum* all confined to the cascaded reaches. Each of the factors studied may exert some influence.

Reference to tables provided by Hynes (1970) shows that current velocities of up to 20, 40 and 60–80 cm s^{-1} are required respectively to transport silt, sand and gravel and the predominance of the latter fractions beneath cascades illustrates the current velocities in these reaches. This may be a key factor for the animals present. Even in rivers, where pool/riffle distinctions are less marked than those described here, *B. rhodani* (Armitage *et al.*, 1974; Scullion *et al.*, 1982), *R. dorsalis* (Egglishaw & Mackay, 1967; Armitage *et al.*, 1974; Armitage, 1976, Scullion *et al.*,

1982) the Simuliidae (Scullion *et al.*, 1982) and most hydropsychids (Wallace and Merritt, 1980) show preferences for riffles. In addition to the respiration of these species (Philipson, 1956; Jaag & Ambuhl, 1964; Philipson and Moorehouse, 1974), the feeding mechanisms of *S. ornatum* (Philipson, 1956; Wallace & Merritt, 1980) and *H. angustipennis* (Philipson & Moorehouse, 1974) require flowing water.

Effects of the substratum on macroinvertebrate distributions are difficult to assess since they are likely to be linked with current velocity (Hynes, 1970; Milner *et al.*, 1981). There may be a direct relationship between substratum particle size and animal diversity (Percival & Whitehead, 1929; Hart, 1978) although this is far from clear (Milner *et al.*, 1981, Scullion *et al.*, 1982). The interstices of stony substrata, similar to those beneath cascades, may be important for net-spinning hydropsychids, particularly in their earlier instars and prior to the spring onset of bryophytic growth on stones (Hildrew & Edington, 1979). Conversely, settlement of silt and clay downstream from cascades may prevent epilithic grazing by species such as *B. rhodani* (Rabeni & Minshall, 1977) but may allow colonization by burrowing chironomids such as *Chironomus riparius* and *C. plumosus* (Walshe, 1951). These and other *Chironomus* spp. dominate the chironomid fauna in the silted reaches of the Huddersfield Narrow Canal.

The diel pattern of oxygen concentration, reflecting the balance between photosynthesis and respiration, has been described previously for other water bodies (Owens & Edwards, 1964), though few data are available for canals. Similarly, the entrapment of air bubbles and the resulting oxygenation of water falling over weirs has been described by Gameson (1957). It is difficult to assess whether the aeration effect has any significance for the species present below cascades. *B. rhodani* (Jaag and Ambuhl, 1964), *R. dorsalis* (Philipson, 1954; Jaag & Ambuhl, 1964) and *H. angustipennis* (Philipson & Moorehouse, 1974) all survived in laboratory experiments at oxygen concentrations which were lower than any recorded by the present study. However, the low oxygen concentrations recorded here relate to only one day: Claasen (1982) has recorded summer daytime oxygen concentrations as low as 11–15 per cent saturation in a Dutch Broad which supports an invertebrate community similar to that at stations 1, 2, 5, 6 and 7. Such concentrations could be stressful to *B. rhodani, R. dorsalis* and *H. angustipennis* (Philipson, 1954; Jaag & Ambuhl, 1964; Philipson & Moorehouse, 1974) and, if they occurred in the Huddersfield Narrow Canal, the cascade aeration effect would be significant, raising the downstream oxygen saturation to 30–35 per cent (Fig. 4).

The taxa recorded by the present study, together with those recorded previously (Fryer, 1950, 1952, 1954, 1955; Watkin & Morphy, 1976; Morphy *et al.*, 1977), bring the macroinvertebrate total of the Huddersfield Narrow Canal to over fifty. This compares with sixteen, twenty, twelve and twenty-eight respectively for the Monmouth and Brecon, Kennet and Avon, Coventry and Leeds and Liverpool canals (Hanbury *et al.*, 1981), although the latter are all navigable and were investigated at only a small number of sites. The presence of cascades is clearly of importance in increasing the number of taxa (Table 2) of the Huddersfield Narrow and in providing the conditions for a specialized lotic fauna. This feature, given the high frequency of locks along the canal's length (Watkin & Morphy, 1977) lends support to earlier observations (Morphy, Thomas & Higgins, 1980) that the Huddersfield Narrow is an interesting industrial relict worthy of some protective status as a wildlife habitat.

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BOOK REVIEWS

The Lake District by **The Cumberland Geological Society**. Pp. xii + 136, including 55 figures and maps. Unwin paperbacks. 1982. £3.95.

This is the fourth in a series of geological field guides. Unlike the other volumes in the series, *The Lake District* is written by eight contributors.

The weather resistant, flexible covered book contains eleven pages of introductory text outlining the disposition and genesis of lake district rocks, followed by thirteen itineraries for geological excursions within the area. There is also a bibliography, a list of museums in the area which have geological exhibits, and a useful glossary and index. The bulk of the book consists of geological itineraries, based largely in the north and west of the region.

Each itinerary begins with a statement of the objectives, a list of useful maps, information about the nature of the itinerary and a concise description of the geological setting. The excursion details are clearly set out with an abundance of OS grid references, comments, sketch maps and photographs designed to guide the reader to the relevant locations. Any competent geographer or geologist should have no difficulty using the guide. Whenever permission is needed from landowners to visit a site, this is clearly stated in the text and instructions are given about who should be contacted. Provided that these strictures are followed, the book is to be welcomed as it will enable more people to take an intelligent interest in the relationship between geology, mineral resources and landscape.

DEC

The Last Dinosaurs by **L. R. Croft**. Pp. 80, with black and white photographs, drawings and diagrams. Elmwood Books, Chorley, Lancashire. 1982. £4.95 hardback, £2.95 paperback.

This book is amusing, but should not be taken too seriously, as I think the author might agree. He puts forward another possible cause for the extinction of the dinosaurs at the end of the Cretaceous period to add to the twenty-five suggestions previously made that he has conveniently collected together in an appendix. He has divided this list into catastrophes and climatic changes, diseases and nutritional problems, miscellaneous and crackpot suggestions. To which of these groups should his idea that the dinosaurs became blind be assigned? Croft and Tabet (1981) have shown that of the two proteins responsible for the optical properties of the lens of the human eye, only one is stable at high temperatures and high light intensities. The stable protein is lacking in living reptilian eyes. Palaeoclimatic evidence suggests that there was a solar radiation maximum at the end of the Cretaceous period. If this was so, and dinosaur eyes were like those of modern reptiles (we have no information whatever on this point), dinosaurs might have suffered from chronic cataract. This would have been a catastrophe due to climate; it could certainly be regarded as a disease; and maybe it falls in the third category of causes of dinosaur extinction as well.

FHB

The Population Ecology of Cycles in Small Mammals. Mathematical Theory and Biological Fact by **J. F. Finerty**. Pp. xiv + 234 (including 83 figures). Yale University Press, New Haven. 1980. £11.90.

This is a review of the evidence for the existence of population cycles followed by an analysis of possible causes. It is a thorough and penetrating account which is certainly not for those who do not relish the mathematical analysis of population processes, being an advanced account for the serious student.

HEAVY METAL LEVELS IN THE FAECAL CONTENTS OF RED DEER *CERVUS ELAPHUS* (L.) IN NORTH-WEST ENGLAND

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Introduction

A number of studies deal with the level of heavy metals in the environment (Mitchell & Reith, 1966; Ruhling & Tyler, 1968; Mueller & Stanely, 1970; Harding & Whitton, 1981) and others with their toxic effects on plants and animals (Aronson, 1971; Harding & Whitton, 1976). Hardisty *et al.* (1974a, 1974b) observed the importance of diet, age, sex, state of sexual maturation and species differentiation as major factors influencing the uptake and regulation of heavy metals. The present study provides data on heavy metal concentrations in the diet and faeces of red deer, *Ceruus elaphus* (L.) and sheep, *Ovis aries* (L.) and forms part of an investigation into chronic effects of pollution in north-west England.

Material and Methods

Faecal samples from red deer were collected monthly over the study period (1979/81) from Lyme Park (SJ/970 826: National Trust Management, area 535 ha) which is relatively remote from any industrial or domestic activity. Random samples were obtained from a herd of approximately 120 deer except in March 1980 and between January and April of 1981 when no deer were present. Similarly, random faecal pellets from sheep were collected in August of each year, when they were present in large numbers and were stored at −10°C until required. Limited analyses were conducted on the key dietary grass species found in the Lyme Park region.

For heavy metal analyses, sample preparation was carried out using a similar method to that discussed by Badsha (1974) but instead of using 2.5 cm^3 of nitric acid and 6 cm^3 of perchloric acid, only 10 cm^3 of 2M nitric acid (Primer Grade) was used for digestion. Samples were first oven-dried for twenty-four hours to constant weight and finely ground. 1 g duplicate samples were then digested in 10 cm^3 of 2M nitric acid and heated in a fume cupboard. After digestion was complete, samples were filtered and the final solutions made up to 25 cm^3 with double distilled water. Two sets of blanks were similarly prepared. Standard solutions used were prepared by Hopkin and Williams (Chadwell Heath, Essex, UK) and these had metal concentrations within ± 0.5 per cent of the normal value at 20°C. The samples, blanks and standard solutions were analysed using a double beam 1L 251 atomic absorption spectrophotometer fitted with a background corrector, to adjust for any non-atomic absorption.

Due to variability of heavy metal levels in vertebrate species (Giesy & Winer, 1977) most statistical analyses have been made using logarithmic ($\log_{10}$) transformation of the raw data. The results are expressed as arithmetic and geometric (devised) means in the tables and figures with appropriate F values (single factor ANOVA).

Results

Varying levels of zinc, lead, cadmium and copper found in the faecal contents of the red deer and the sheep at Lyme Park are presented as $\mu g\ g^{-1}$ dry weight in Tables 1–5 and illustrated in Figs 1–3.

Zinc

While there have been short-term fluctuations in zinc concentrations (Fig. 1), longer term trends can nevertheless be recognized. Overall zinc levels in the faecal pellets of the red deer have dropped from a peak in 1979 (118 $\mu g\ g^{-1}$) to 78.17 $\mu g\ g^{-1}$ (1981), though the fall is less dramatic between 1980 and 1981 ($p < 0.05$). Peak concentrations of zinc occurred in April/June in 1979 and 1980 but in August of 1981; no reason for this shift was apparent. Interestingly, whilst peak

TABLE 1

Monthly variations in zinc concentrations ($\mu g\ g^{-1}$ dry weight) in faecal samples of red deer, *Cervus elaphus* obtained at Lyme Park over the period 1979–81 (a = arithmetic means and b = geometric means, derived from $\log_{10}$.

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
(a) 1979 $\bar{x}$	101.45	91.68	110.82	117.00	No samples	118.29	114.37	84.63	83.11	86.51	73.87	81.78
CL+	106.50 96.40	99.78 83.57	118.08 103.55	127.89 106.35		124.42 112.15	123.02 105.71	94.87 74.40	91.16 75.21	87.53 85.49	78.82 69.02	85.89 77.66
1980 $\bar{x}$	59.55	64.25	74.31	75.42		75.69	73.00	58.80	No samples	62.44	No samples	No samples
CL	61.12 58.00	65.64 62.87		80.40 68.22	87.97 62.87	81.54 69.83	75.76 70.24	62.67 54.93		64.23 60.65		
1981 $\bar{x}$		No samples			75.41 78.20 72.63	78.17 81.72 74.61	80.71 82.16 79.26	86.57 88.43 84.70	65.32 66.34 64.29	65.12 66.28 63.95	58.43 61.03 55.82	69.29 72.33 66.26
(b) 1979 $\bar{x}$ $\log_{10}$	101.22	91.40	110.54	116.60	No samples	118.13	114.20	84.29	82.91	86.51	73.87	81.65
CL	106.45 99.25	99.90 83.63	117.68 103.83	127.89 106.31		124.45 112.12	123.08 105.96	95.84 74.13	91.39 75.21	87.54 85.49	78.93 69.14	85.91 77.60
1980 $\bar{x}$	59.51	64.24	66.25	74.13	75.42	75.62	72.48	58.73	No samples	62.43	No samples	No samples
CL	61.12 57.95	65.63 62.88		80.17 68.54	88.68 63.95	81.71 70.00	75.79 70.28	62.72 55.00		64.24 60.67		
1981 $\bar{x}$		No samples			75.32 78.17 72.57	78.02 81.73 74.48	80.68 82.15 79.25	86.53 88.45 84.65	65.30 66.34 64.28	65.10 66.28 63.93	58.32 61.02 55.74	69.18 72.17 66.32

+ Confidence limit determined from n > 20.
* One sample.

TABLE 2

Seasonal concentrations of lead ($\mu g\ g^{-1}$ dry weight) faeces of red deer obtained from Lyme Park (a = arithmatic means and b = geometric means).

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
(a) 1979 $\bar{x}$	46.55	50.83	106.88	117.92	No sample	22.71	27.50	27.27	29.04	34.18	39.91	44.92
CL+	61.75	55.99	116.30	130.71		25.23	34.44	32.59	31.43	38.03	44.52	51.80
	31.35	45.67	97.45	105.12		20.19	20.56	21.95	26.66	30.34	35.29	38.03
1980 $\bar{x}$	35.90	49.25	60.50*	50.13	9.00	12.06	16.38	18.30	No sample	22.86		No sample
CL	41.84	55.69		54.73	13.07	14.18	23.04	20.64		26.08		
	29.96	42.81		45.52	4.93	9.95	9.71	16.00		19.67		
1981 $\bar{x}$		No samples			11.51	16.06	25.06	36.81	38.06	43.81	45.00	53.93
					12.11	17.41	26.71	38.30	45.44	45.04	45.83	55.84
					10.91	14.72	23.41	35.41	30.68	42.57	44.16	52.02
(b) 1979 $\bar{x}$	42.90	50.62	106.33	117.35	No sample	22.58	27.11	27.01	28.99	34.07	39.82	44.27
CL	57.72	56.29	116.54	131.76		25.14	33.96	32.61	31.43	38.06	44.72	51.47
	31.88	45.53	97.01	104.50		20.27	21.65	22.38	26.75	30.50	35.47	38.09
1980 $\bar{x}$	35.04	49.05	60.51	49.97	9.00	12.00	16.02	18.22	No sample	22.81		No sample
CL	41.36	55.51		54.76	13.07	14.31	23.33	20.76		26.27		
	29.69	43.33		45.59	4.93	10.08	11.00	15.99		19.80		
1981 $\bar{x}$		No samples			11.48	15.95	24.95	36.75	36.70	43.78	45.00	53.87
					12.09	17.49	26.67	38.29	45.18	45.10	45.81	55.87
					10.90	14.55	23.34	35.28	29.81	42.49	44.17	51.94

+ Confidence limit determined from $n > 20$.
* One sample.

TABLE 3

Monthly fluctuations in cadmium levels (μg g^{-1} dry weight) in faecal sample of red deer from the study area over the period 1979–81 (a = arithmetic means and b = geometric means).

	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
(a) 1979 $\bar{x}$	5.84	7.47	3.69	5.04	No samples	4.39	12.15	13.12	13.12	15.09	15.22	17.51
CL+	7.76	8.24	4.66	7.55		6.18	15.44	13.44	13.44	15.92	17.24	18.23
	3.91	6.69	2.72	2.53		2.61	8.86	12.79	12.79	14.26	13.21	16.79
1980 $\bar{x}$	11.68	13.95	14.00*	11.67	3.88	7.69	8.94	11.70	No samples	12.38		No samples
CL	11.76	14.69		11.80	5.23	9.12	9.98	12.35		12.61		
	11.59	13.21		11.53	2.52	6.26	7.90	11.15		12.15		
1981 $\bar{x}$		No samples			4.21	5.27	7.44	8.45	10.62	27.29	31.25	32.77
CL					4.69	5.77	8.02	9.59	12.54	28.78	32.66	34.01
					3.73	4.77	6.86	7.32	8.70	25.81	29.84	31.54
(b) 1979 $\bar{x}$	5.28	7.43	3.54	4.57	No samples	4.07	11.91	13.11	13.11	15.08	15.18	17.49
CL	7.42	8.26	4.57	7.65		5.97	15.77	13.44	13.44	15.93	17.25	18.22
	3.75	6.70	2.74	2.74		2.78	9.00	12.80	12.80	14.26	13.36	16.79
1980 $\bar{x}$	11.67	13.94	14.00	11.67	3.85	7.65	8.92	11.69	No samples	12.37	No samples	No samples
CL	11.76	14.68		11.80	5.55	9.27	10.03	12.25		12.61		
	11.59	13.24		11.53	2.67	6.31	7.93	11.16		12.15		
1981 $\bar{x}$		No samples			4.16	5.23	7.40	8.33	10.33	27.22	31.19	32.73
CL					4.70	5.77	8.00	9.46	12.32	28.76	32.64	33.98
					3.69	4.73	6.85	7.35	8.67	25.77	29.81	31.52

+ Confidence limit determined from $n > 20$.
* One sample.

TABLE 4

Levels of zinc, lead, cadmium and copper ($\mu g\ g^{-1}$ dry weight) faecal sample of sheep from Lyme Park region (a = arithmetic means and b = geometric derived means).

	Zinc	Lead	Cadmium	Copper
(a) 1979 $\bar{x}$	122.92	9.75	2.39	13.87
CL +	128.34	10.16	2.69	14.68
	117.49	9.35	2.10	13.06
1980 $\bar{x}$	179.25	15.36	2.90	22.48
CL	184.64	16.27	3.11	24.76
	173.86	14.44	2.69	20.19
1981 $\bar{x}$	70.34	22.65	6.45	30.10
CL	75.36	23.94	6.72	32.40
	65.33	21.36	6.21	27.80
(b) 1979 $\bar{x}$	122.70	9.73	2.36	13.83
CL	128.33	10.15	2.66	14.63
	117.31	9.33	2.09	13.08
1980 $\bar{x}$	179.19	15.34	2.90	22.38
CL	184.71	16.28	3.11	24.84
	173.84	14.45	2.70	20.17
1981 $\bar{x}$	70.45	22.65	6.46	29.94
CL	75.02	23.94	6.72	34.40
	65.40	21.36	6.21	27.67

+ Confidence limit determined from $n > 20$.

zinc concentrations were observed in late spring/summer, the lowest levels of lead and cadmium were found during this period. With the exception of 1981 (Table 4), levels of zinc are significantly higher in sheep than in red deer ($p < 0.001$).

Lead

The pattern of lead distribution in deer (Fig 2) appears to be uniform apart from very high levels observed in March/April 1979. Overall values do not indicate any marked short-term variations. The general trend shows a rise in peak values in March-April, declining rapidly in June, only to rise gradually to a new maximum in March/April of the following year (Table 2). Rate of excretion of lead in the faecal samples of the deer has increased over the study period. Thus between the summer and winter of each year, lead values increased by a factor of 1.9, 2.5 and 4.7 between 1979, 1980 and 1981 respectively.

In contrast to zinc, lead levels are significantly lower in sheep than in deer (Table 4), and over the period 1979–81 the actual levels increased by a factor < 2.5 from 9.75 to 22.65 $\mu g\ g^{-1}$ respectively.

Cadmium

Apart from the differences in actual values, the trend in the distribution of cadmium is similar to that of lead in the deer at Lyme Park (Table 3), with peak values attained in winter as compared to early spring in lead. Lowest levels were found in early summer, rapidly increasing to a peak concentration in winter ($p < 0.001$) and thereafter declining gradually to a low level in the late spring of the following year (Fig. 3). Whilst the differences in actual values between the summer and winter of both 1979 and 1980 were not significant ($p < 0.05$), in 1981 concentrations rose dramatically from 4.21 $\mu g\ g^{-1}$ in May to 32,77 $\mu g\ g^{-1}$ in December.

As in the case of lead, cadmium levels were markedly lower in the sheep than the deer ($p < 0.001$) (Table 4). Cadmium values in sheep increased from 2.39 $\mu g\ g^{-1}$ in 1979 to 6,45 $\mu g\ g^{-1}$ in 1981 although the difference is less apparent between 1979 and 1980 ($p < 0.05$).

FIGURE 1

Concentrations of zinc in faecal sample of red deer, *Cervus elaphus* obtained from Lyme Park with 95 per cent CL.

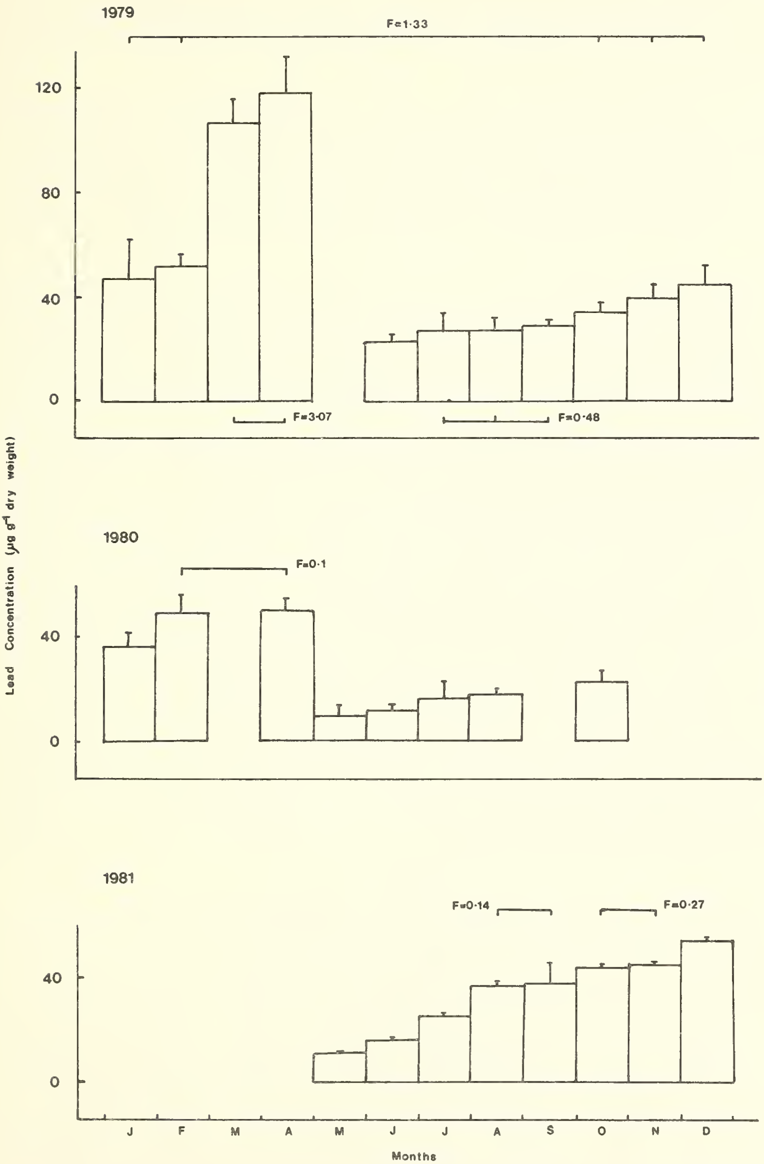

FIGURE 2
Levels of lead in the faecal contents of red deer at Lyme Park.

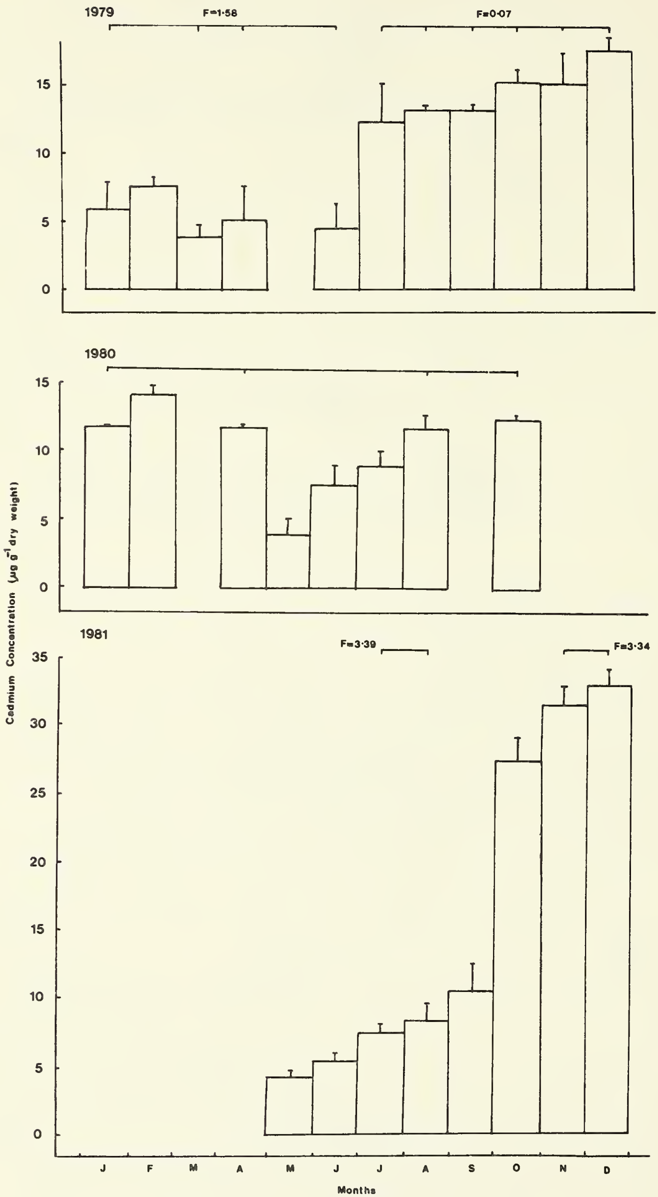

FIGURE 3
Variations in cadmium levels in faecal samples of red deer at Lyme Park.

Copper

Despite the data being limited to 1981 only, a bimodal pattern of distribution can be seen in the deer sample at Lyme Park (Table 5). From a low in May there is a gradual but significant increase in copper concentrations, peaking off in September and declining thereafter to reach a new peak in December. Where data are available for August of the three years studied (Table 4), indications are that copper excretion in sheep rose sharply ($p < 0.001$).

Diet

All metals (zinc, lead and cadmium).

Data for the dietary grass species of the red deer (Table 6) are less extensive than those given for the faecal contents. In general the zinc values increased by a factor greater than two, reaching a peak in August and gradually declining to a low in winter. Lead and cadmium register an increase, attaining peak values in winter, the trend being similar to that observed in the faecal pellets.

Discussion

The region under investigation has been subjected to much pollution in the past (Livett *et al.*, 1979; Badsha & Goldspink, 1982) and the findings of the present study suggest this to be still true today. Thus, over the three-year study period, the levels of cadmium and lead increased gradually, although less significantly in 1980, with a corresponding decrease in zinc values ($p < 0.001$) for 1981. The trend in heavy metal levels in the faecal samples are consistent with those found in a number of key dietary grass species (Table 6). This suggests that diet is a major source of heavy metal intake with breeding activity and length of exposure as contributing factors. Despite high levels of cadmium and lead found in the course of this study, there is no evidence to suggest that the performance of the deer or sheep and the main dietary constituents have deteriorated over the years. This is contrary to observations by other workers (Allcroft, 1951; Aronson, 1971; Samarawickama, 1979) investigating the effects of heavy metals on cows, horses and sheep. Blaxter (1950), however, found that in sheep (50 kg live weight) 98.7 per cent of lead intake was excreted via the faeces, thus giving an apparent absorption of only 1.3 per cent, and concluded that a daily intake of up to 3 mg of lead was equivalent to the excretion rate. Similarly for cadmium, Balazs (1970) found absorption, storage, metabolism and elimination processes dependent upon effective concentration of the agent at the receptor site.

To understand the seasonal fluctuations in heavy metal concentrations, three major factors have to be taken into consideration, in addition to a host of minor variables. The dramatic decrease in cadmium and lead values observed in May/June coincide with the arrival of fresh tender shoots which have not been subjected to long-term exposure to the effects of aerial pollution. Coupled with breeding activity, this period is further marked by intensive feeding, thereby possibly attaining threshold limits of metal concentrations. Thereafter with longer term exposure to aerial pollution ($Pb < 6$ and $Cd < 6$ between summer and winter) together with

TABLE 5

Variations in copper concentrations ($\mu g\ g^{-1}$ dry weight) in faecal sample of deer from Lyme Park (a = arithmetic means and b = geometric derived means).

	May	June	July	Aug	Sept	Oct	Nov	Dec
(a)	8.26	9.67	10.35	12.57	16.59	11.71	10.13	14.39
Copper CL+	9.47	10.76	12.38	16.67	18.43	13.61	11.13	15.98
	7.04	8.58	8.32	8.48	14.75	9.81	9.15	12.81
(b)	8.09	9.56	9.94	11.43	16.42	11.45	10.05	14.25
Copper $\bar{x}$	9.41	10.71	12.47	15.90	18.24	13.42	11.02	15.83
CL	6.97	8.54	7.92	8.21	14.79	9.77	9.17	12.83

+ Confidence limit calculated from $n > 20$.

TABLE 6

Fluctuations in heavy metal concentrations in the diet of red deer at Lyme Park, 1981 (grass samples unwashed).

	Means with confidence limit	Concentrations expressed as $\mu g\ g^{-1}$ dry weight		
		Zinc	Lead	Cadmium
April	$\bar{x}$	243.84	64.70	28.58
	CL	255.90	66.50	32.46
		231.80	62.93	24.70
May	$\bar{x}$	263.73	15.41	4.60
	CL	272.60	17.11	4.83
		254.87	13.71	4.30
June	$\bar{x}$	306.52	27.44	5.28
	CL	316.70	30,00	5.62
		296.35	24.93	4.94
July	$\bar{x}$	282.31	41.48	6.66
	CL	289.71	43.02	6.92
		274.75	39.93	6.40
August	$\bar{x}$	409.24	59.60	17.92
	CL	417.41	63.47	19.21
		401.10	55.60	16.62
September	$\bar{x}$	375.24	67.28	24.22
	CL	385.22	69.05	25.80
		365.10	65.51	22.64
October	$\bar{x}$	230.00	77.91	28.60
	CL	238.40	79.60	29.61
		221.50	76.20	27.50
November	$\bar{x}$	197.14	88.86	29.50
	CL	202.63	90.50	29.81
		191.64	87.22	29.12
December	$\bar{x}$	107.54	97.15	29.80
	CL	117.58	100.81	30.06
		97.50	93.50	29.51

Confidence limit calculated from $n > 20$.

increasing tenacity of plant material (less digestible) and greater rate of excretion of metals (when the threshold limit is achieved), faecal concentrations of lead and cadmium progressively increase, reaching their maximum values in winter. Mean concentrations during this period in major grass species is 107.54, 97.15 and 29.80 $\mu g\ g^{-1}$ dry weight of zinc, cadmium and lead respectively. A similar disparity between metal values and seasons was observed by Rains (1971) and Mitchell and Reith (1966). In addition, the winter period is further influenced by the presence of dead grass which has a tendency to retain heavy metals in greater quantities at cellular level; a much wider study (Badsha, 1983) reports the ratio of metal between 'live' and 'dead' grass at 1:3.5, 1:2.0 and 1:2.1 for lead, cadmium and zinc respectively. These ratios are similar to those observed by Ratcliffe and Beeby (1980) for lead in grasses alongside road verges and are attributed to differences in the breakdown of the cuticle.

It was observed that heavy metal concentrations, particularly lead, were significantly lower ($p < 0.001$) in the dietary grass species at the study area than those recorded for north-west England (Shimwell and Laurie, 1972; Fielding *et al.*, 1983) but relatively higher compared with the rest of the United Kingdom (Little & Martin, 1972, 1974). No data are available for making similar comparisons for faecal material.

SUMMARY

The present study shows that lead and cadmium concentrations increased, whereas zinc decreased, in the faecal samples of sheep and deer over the period studied. Seasonal trends were found to be pronounced for lead and cadmium, from low levels in early summer to peak levels in the winter. Major factors responsible for the variations in the lead and cadmium levels were the availability of food, breeding activity and length of exposure of the dietary constituents to the effects of aerial pollution.

ACKNOWLEDGEMENTS

I am grateful to Mr E. Latusek for his assistance in the collection of the samples, Ms L. A. Nicholas for her help at various stages of this study, and to Dr M. R. D. Seaward for his valuable and constructive comments.

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BOOK REVIEWS

The Cacti of the United States and Canada by **Lyman Benson**. Pp. 1044; illustrated in colour and black and white. Stanford University Press. 1982. $85.00.

The popularity of cacti as cultivated ornamental plants has resulted in the publication of a vast literature on the family. Unfortunately many authors of popular, semitechnical and even technical books and papers have enormously inflated the number of species and genera described, by arbitrary splitting frequently based on single characters. Britton and Rose in their standard work *The Cactaceae* (in four volumes, 1919–23) were to some extent guilty of this. We must be grateful to Lyman Benson for coming to grips with the problem and bringing order out of chaos. He estimates that the Cactaceae includes about seventy-five genera and from 800 to 1500 (possibly more) species. His book deals with the 151 species (grouped in 18 genera) that are native or naturalized in the United States of America and Canada. Britton and Rose recognized thirty-three genera for the same area, and a much larger number of species; many of the latter are regarded as varieties by Benson, who considers this taxonomic category as very useful in the Cactaceae. He only mentions species from Mexico and the Caribbean when reference to them is necessary to understand related forms in the USA and Canada. One may regret that he did not set out to monograph the family on a world scale (that is, a New World scale, for only one genus occurs outside the Americas). To have done so however would have more than doubled the task, and moreover the necessary information, especially with regard to distribution, is just not available.

The main part of the book is the systematic treatment. As a general framework, Benson uses a scheme published by D. R. Hunt in 1967. It is welcome to see this reprinted in full, for it appeared in J. Hutchinson's uncompleted *The genera of flowering plants*, a work not available to many. Benson takes a conservative view of species limits, but under each genus he gives in addition an annotated list of names used by Britton and Rose. His descriptions of the species are illustrated with excellent drawings by Lucretia B. Hamilton, and photographs, mainly by the author. All the latter are good, and many of those in colour are outstanding. In addition distribution maps are given wherever appropriate. The variety exhibited by a genus like *Opuntia* is astonishing; even in Benson's conservative treatment fifty species are recognized. He describes seventeen species of *Cereus*; Britton and Rose have five times this number in twelve genera, but Benson considers that the information available is still insufficient for an adequate reclassification of the genus.

The whole arrangement makes a balanced scheme, but for the reader who may prefer other interpretations, an invaluable feature of the book is the final section entitled 'Documentation' where a complete list of synonyms with full references is given for every genus, species and variety. The long introduction to the book is intended to make the work interesting to non-specialists. The rather full treatment of Luther Burbank and his spineless prickly pears is fascinating, and so is the discussion of how the genus *Rhipsalis* came to be found in Africa and Sri Lanka as well as America. There is a long section on the floras and floristic associations of North America which goes far beyond a consideration of the cacti. On the other hand, sections on physiology by F. W. Went and on chemical characters of cacti by D. L. Walkington and B. S. Bean are disappointing. But as well as being an outstanding taxonomic treatment of a unique family of flowering plants, this book is worth reading for the light it sheds on the general principles of classification, evolution and ecology.

FHB

The Illustrated Book of Herbs by **Gilda Daisley**, with illustrations by **Ingrid Jacob**. Pp. 28, including 33 full-page colour illustrations, and numerous woodcuts. Ebury Press. 1982. £7.95.

An attractive book, but there are more comprehensive and informative works on the subject available. The author's basis for inclusion as a herb is idiosyncratic: for instance, few people would consider lime and elder to be 'herbs', and only forty-one plants are covered (including nasturtium, marigold and geranium) thereby excluding many more obvious choices. Ingrid Jacob's illustrations are both decorative and accurate, but one would have appreciated information on the many additional illustrations taken from early herbals which form an equally important component of the book.

VAH

HEIGHT AND SUPPORT OF REED WARBLER NESTS

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During a long-term study of a breeding colony of Reed Warbler (*Acrocephalus scirpaceus*) at Rostherne Mere NNR, North Cheshire, attention was paid to nest construction and height above water or mud (measured from the lowest part of the nest) see — Table 1.

All the nests located had been built amongst the stems of reed (*Phragmites communis*), but occasionally individual stems of the following plants had been used: Lesser Reedmace (*Typha angustifolia*), Woody Nightshade (*Solanum dulcamara*), Rose-Bay Willow-Herb (*Chamaenerion angustifolium*), Stinging Nettle (*Urtica dioica*), and Currant (*Ribes* sp.).

As the reedbeds are peripheral to the large mere, most growth is in or near water. Weather and Starling (*Sturnus vulgaris*) roosts cause damage to the reeds over the winter and new growth becomes dominant by mid-June. The reliance placed in the new reeds as nest supports is evident (see Table 2) but Catchpole (1974), using a sample of 107 nests, mainly built over mud or silt, at a created habitat in Nottinghamshire, found that only 18 per cent of nests relied solely on the new stems and, by contrast, 40 per cent involved old reeds only.

At Rostherne Mere, over 92 per cent of nests had been constructed on two, three, four or five reeds (see Table 3) with most on three or four reeds (mean 3.57). Howard (1910) suggested that a nest built on two reeds would not be durable, but 16 per cent of the Rostherne Mere nests were

TABLE 1
Nest Height

Season	n	Extremes (cm)	Average (cm)
1977	75	18–112	70.43
1978	48	46–137	79.33
1979	49	22–145	74.96
1980	46	23–141	80.65
1981	59	41–127	82.58
1982	63	43–129	81.22
Total	340		Overall 77.83

TABLE 2
Type of reeds used in nest construction

Season	n	Old	New	Mixed	Other plants included
1977	77	4 5.19%	43 55.84%	27 35.07%	3 3.90%
1978	49	2 4.08%	30 61.23%	16 32.65%	1 2.04%
1979	51	8 15.69%	29 56.86%	11 21.57%	3 5.88%
1980	53	7 13.21%	30 56.60%	15 28.30%	1 1.89%
1981	63	4 6.35%	39 61.90%	20 31.75%	nil
1982	70	2 2.86%	46 65.71%	22 31.43%	nil
Total	363	27 7.44%	217 59.78%	111 30.58%	8 2.20%

TABLE 3
Number of reeds used per nest

Number of reeds	n (nests)	
2	58	15.98%
3	150	41.32%
4	89	24.52%
5	38	10.47%
6	17	4.68%
7	7	1.93%
8	2	0.55%
9	2	0.55%
	Total 363	3.57 mean

dependent on only two reeds and, whilst one damaged hinge would normally cause the nest to collapse, some of the best examples of nest-building have involved the use of two reeds.

SUMMARY
At Rostherne Mere the 'average' nest was built at *c.* 78 cm above water. Sixty per cent of nests were built solely on new reeds and 66 per cent relied on three or four stems for support. The importance of new reeds may have been a habitat-related factor.

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THE REV EDMUND JAMES PEARCE, C.R., M.A., F.R.E.S. (1903–1982)

James Pearce was born on 1 July 1903, the son of the Rev E. C. Pearce, later Dean of Corpus Christi College, Cambridge, and Lord Bishop of Derby. After preparatory school he passed to Sherborne School in Dorset and from there went on to Sidney Sussex College, Cambridge, where he graduated in Natural Science. After Cambridge, two years were spent at Cuddeston Theological College, Oxford, and after ordination he became a curate of St Mark's Church, Swindon, where he remained for seven years. In 1935 he entered the House of the Resurrection at Mirfield in order to test his vocation for the religious life, and two years later he was professed as a Member of the Community.

Soon after the outbreak of war in 1939, he was appointed Chaplain in the Royal Air Force, serving in that capacity until 1945; on his release the next ten years were spent at Codrington College, Barbados before finally returning to Mirfield in 1968.

He joined the Entomological Society (now the Royal Entomological Society of London) in 1922 and at the time of his death on 10 July 1982, was its longest standing Fellow. He became a Life Member of the Yorkshire Naturalists' Union in 1945.

An enthusiastic naturalist from an early age, he was fortunate in having his interests greatly encouraged and strengthened at Sherborne School where he won his first school prize, very appropriately, for the best collection of local beetles. Though a competent entomologist generally, the Coleoptera became his greatest interest and he went on to specialize, firstly in the Haliplidae and later in the Pselaphidae. He was the author of Part 9 (the Pselaphidae) of volume 4 of the *Handbooks for the Identification of British Insects* published by the Royal Entomological

Society in 1957. This was the first handbook to deal exclusively with the British Pselaphidae, a group of very small predaceous beetles which are to be found in leaf litter, grass tussocks and in decaying trees.

James Pearce and I first met on a collecting trip to Askham Bog in 1945 where, in the company of the late Dr Douglas Hincks, we joyfully captured several specimens of *Dromius sigma* Rossi and discovered the habitat where it had evidently been common for many years. For the next thirty years we met, unfortunately all too infrequently, when he was in England. Always a cheerful and very energetic collector, his visits as our guest for collecting trips both in Yorkshire and in Devonshire were greatly enjoyed.

He was ever a kindly and considerate man and happy in his work wherever his Community sent him. Only once during the long years of our friendship did I hear him complain of anybody or anything. This single complaint was that on the island of Barbados there was a distinct scarcity of beetles! On account of this, for a time, he turned his interest to Lepidoptera. During the ten years in Barbados he did manage an annual holiday on one or other of the West Indian islands where he found the beetles much more plentiful.

His personal collection of the British Pselaphidae has for some years been incorporated into the National Insect Collection at the British Museum of Natural History in London.

From 1968 onwards most of his time was spent at the Community House in Mirfield where, sadly, several years of his life were clouded by ill health and near blindness. His brethren of the Community together with his many entomological friends will miss him greatly and to them all our sympathies are extended.

TBK

SAND MARTINS NESTING IN PEAT FACES IN BRITAIN

MARTIN LIMBERT

Museum and Art Gallery, Doncaster

In the *Atlas of Breeding Birds in Britain and Ireland* (Sharrock, 1976), a summary is given of the types of breeding sites used by Sand Martins *Riparia riparia*. This includes the comment that in Ireland, the faces of peat cuttings and stacks of drying peat are recorded as being utilized by the species, Ruttledge (1966) for example, having earlier noted: 'Nesting colonies of a few pairs are sometimes found in the face of turf banks; in one case the colony was of 50 pairs.'

It is worth noting however, that British Sand Martins have also been known to utilize faces of cut peat, though the habit appears to be localized. Thomas Bunker (1898), G. E. Bunker (1905), Nelson (1907) and Chislett (1952) all refer to Sand Martins nesting in peat cuttings on Thorne Moors (South Yorkshire/North Humberside). Nelson commented that on this moorland Sand Martins were noted 'drilling the peat sides of the trenches cut for the drainage of the moss', and Chislett remarked 'on the low ground about Thorne nesting tunnels are driven into the faces of cuttings in the peat. On the moors of the North and West Ridings a few birds use the sides of gullies and peat-hags not unusually'. Holmes (1960) has specifically referred to peat nesting occurring at Malham Tarn.

Outside Yorkshire, I have traced only a single reference to Sand Martins using nesting holes in peat faces in Britain, observed on the peat moors of Somerset (Lewis, 1955).

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BOOK REVIEWS

The Spur Book of Birdwatching by **Peter Conder**. Pp. 64, with numerous black and white drawings by David Wilson. Warne. 1982. £1.25.

Written by the former Director of the Royal Society for the Protection of Birds, this book is one of a long 'Venture Guide' series of small introductory works on outdoor pursuits, this one clearly aimed at the novice.

Written in a rather over-personalized style, it guides the beginner through the processes of buying the right gear, a code of conduct for the observer in the field, identification, record keeping, field projects to pursue, places to see good birds and when, regional and national organizations to join and more advanced works of reference to move on to.

The sections on choice of optics and clothing and on record keeping are probably the most useful for the beginner, and the book could, perhaps, be recommended on the strength of this. However, much of the work appears to be an amalgam of information already widely available in existing field guides, which, in my view, would be a much better, if slightly more expensive buy, even for the beginner.

MD

Pond Watching by **Paul Sterry**. Pp. 176, with 99 full colour and b/w photographs and line illustrations. Severn House Publishers. 1982. £8.95.

This excellent little book is for the beginner who is becoming interested in the animals and plants to be found in ponds and other natural and man-made freshwater habitats. It has a long illustrated chapter on the animals and plants to be found in such habitats, including a survey of microscopic forms; it was however rather surprising to see the fungi and bacteria grouped with the animals! There is also a long chapter on pond and aquaria projects, including the use of photography and microscopy, the mapping of plant cover, smooth newt courtship, molluscan feeding, etc, plus an interesting study on ostracod reproduction. Practical techniques on the making and use of equipment for collecting and the construction of aquaria for culturing organisms are also well described. Shorter chapters covering the description of freshwater habitats, the physical and chemical properties of water, the ecology of freshwater organisms and the need to conserve the freshwater environment are also included. The photographs, particularly those in full-colour, and illustrations are of a high standard. The appendices give details of the scientific names of animals and plants mentioned in the text, useful addresses and suggestions for further reading, including identification guides. I thoroughly recommend this book for anyone just becoming interested in the natural history of freshwater organisms.

MEA

The Marshland World by **Ron Wilson** and **Pat Lee**. Pp. viii + 152, with many colour and black and white illustrations. Blandford Press. 1982. £8.95.

The uncertain future of the marshes, fens, swamps, and bogs, inelegantly termed wetlands, has received a good deal of publicity and this general account is sure to be welcomed by many readers. It is an attractive book, plentifully illustrated with some splendid colour photographs of flowers, insects, birds and marshland scenes, mainly, one guesses, from Norfolk. The text defines marshland and describes man's influence in maintaining it. The narrative is something less than satisfying tending to become an annotated catalogue of species with brief descriptions that are not needed by those who know them and not very informative for those who don't.

The book is commendably free from misprints and I only noted the rather amusing *Rumex hydrolaphatum* It is not so free from errors. The 'brandy bottle' is the yellow, not the white, water-lily. Reed-beetle (*Donacia*) larvae do not burrow into plant stems, they attach themselves to the rhizomes and roots. *Hydrobius fuscipes* does not have a series of eleven black spots on each elytron, its elytra are black. The reed bunting is not a close relative of the reed warbler. The teal which breeds in our marshes is, as stated, *Anas crecca*, but it is not the green-winged teal which is *carolinensis*, a rare vagrant from America. There are also odd statements such as the ash, that typical tree of our upland limestone hillsides, 'does well in marshy habitats because it requires a continuous supply of water', and in the case of caddis-flies, 'Before death, mating takes place.' From the acknowledgements we gather that Pat Lee supplied many factual notes, while Ron Wilson wrote the narrative and accepts responsibility for the errors.

JHF

THE OCCURRENCE OF *RAMALINA FARINACEA* (L.) ACH. ON MILLSTONE GRIT IN CENTRAL HALIFAX

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and

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On 7 April 1983 we were extremely surprised to find a young fruiticose lichen, *Ramalina farinacea* (L.) Ach., about 1.5 cm tall (see Plate 1), growing in central Halifax at a height of 1 m on a high (up to 10 m) Millstone Grit wall, the retaining wall and high side of an old railway cutting, looking SSW over Old Lane, a well-used industrialized road. At the foot of the wall lies a narrow strip of waste ground underneath which the disused tunnel passes. Dominant lichens on the wall are *Cladonia chlorophaea*, *Lecanora conizaeoides* and *Lepraria incana* with occasional *Cladonia fimbriata*, *Lecanora dispersa*, *Rinodina gennarii* and *Verrucaria muralis*, all common and expected plants in such an urban situation. Also present are two small thalli of *Parmelia saxatilis/sulcata*, the larger of them (5.5 cm^2) already markedly polyphyllous and becoming imbricate.

PLATE 1

Young thallus (1.5 cm) of *Ramalina farinacea* (sorediate on the tip of one shoot) growing near the base of a high Millstone Grit wall near Old Lane, Halifax.

Ramalina farinacea is a plant which may occur near the base of trees when sulphur dioxide concentrations in the air are within the range 55–65 $\mu g/m^3$ (ie zone 5 of Hawksworth and Rose (1970) scale). The plant's saxicolous occurrence in Old Lane is anomalous; the sooty, generally polluted condition of the Millstone Grit walls in the neighbourhood is representative of previous heavier levels of pollution. Although sulphur dioxide observations in Halifax over the last twenty years show an impressive decline in concentrations, highest daily readings from the five stations operating in 1979–1980 ranged from 112 to 311 $\mu g/m^3$ (*cf* annual mean figures ranging from 31 to 73 $\mu g/m^3$ over the same period).

There are only two modern records for *R. farinacea* in the West Yorkshire conurbation (see Seaward 1975, 1981), one of a plant growing on a decorticate stump at Luddenden (*c* 5 km distant from the Old Lane site), the other on willow at Sowerby Bridge (*c* 5 km distant). The likeliest means of the plant's arrival at the Old Lane site would seem to be diaspore carriage by bird, either by physical attachment or by consumption-excretion with possible rainwash transport downwards from a wall-top perch (see Bailey & James 1979). It will be intriguing to observe the plant's performance in this urban, industrialized habitat.

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BOOK REVIEWS

Lichens and Air Pollution by **Peter James**. Pp. 28, including 2 tables and several figures. London: British Museum (Natural History)/BP Educational Services. 1982. £0.85.

This booklet has been prepared to complement Claire Dalby's splendid wallchart commissioned by the British Museum (Natural History). Introductory information, mainly on the use of lichens to monitor air pollution, is followed by taxonomic and ecological notes on each of the species illustrated on the wallchart. Users of the chart will find the booklet generally helpful, but care should be taken in interpreting ambient pollution levels. Firstly, where the level of sulphur dioxide is reasonably constant from year to year or on the increase then the air quality can be monitored, but much of the United Kingdom is experiencing, or has recently experienced, amelioration following the implementation of the Clean Air Acts; under such conditions lichens are unreliable monitors. Unfortunately, this important point is overlooked. Secondly, the toleration levels of many of the lichen species featured are inconsistently (sometimes ambiguously) presented in the notes; values could be interpreted as upper or lower limits or in some cases as the range.

The opportunity should also have been taken to recommend possible lines of further study of these fascinating plants, including the advantages of joining the British Lichen Society.

It is to be hoped that when the booklet is revised, these omissions, together with several spelling mistakes (particularly the latin nomenclature in Table 1), will be duly rectified.

MRDS

Kew: Gardens for Science and Pleasure edited by **F. Nigel Hepper**. Pp. viii + 195, well illustrated. HMSO. 1982. £9.95.

A lavishly-illustrated hardback guide containing an informative background to the many facets of the work at Kew Gardens and Wakehurst Place, Sussex. Authoritative contributions under the three main headings of 'Gardens for pleasure', 'Living botanical collections' and 'Botanical research' are provided by sixteen members of the Kew staff, together with a chapter on the historical setting of Kew and a postscript on its future.

Those who are already familiar with Kew will find much of interest in this book, and it should also stimulate others to visit Britain's foremost botanical garden.

YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1982

compiled by

C. PELLANT and H. S. PELLANT

GOLDSBOROUGH (VC 64), 15 and 16 May (Mrs J. Payne)

The weather was still, sunny and very warm for May. Areas investigated included Ribston Park, Great Wood and Goldsborough Moor Woods, Allerton Park lake and pleasure garden, and the Knaresborough Ringing Station and Nature Reserve. Owing to the early date, wild and game birds were still nesting, so the party kept to the public footpaths. The 10 km squares worked were SE 35 and 45.

A total of fifty adults attended the excursion over the two days. Twenty-five people stayed for the meeting, held after tea at the Bay Horse Inn, Goldsborough, on the Sunday afternoon. Mr J. H. Flint presided at the meeting.

We are grateful to those who allowed access to their property: Messrs. Dent for the Ribston Estate, Lord Mowbray for Allerton Park, and John Mather, our President, for the visit to the Ringing Station. Our thanks are also due to Mike Smith and colleagues for a demonstration of ringing nestlings.

Ornithology (Mrs J. Payne)

Birds typical of arable land, parkland and woodland were seen. There were parties of Mistle Thrushes in Ribston Park, and Curlews were seen and heard there. A Kingfisher was seen at Gunriff's Beck, where a Grasshopper Warbler was 'reeling' the week before the meeting. A dead Heron was found by the footpath. Waterfowl were present at Allerton Park lake.

Mammals and Other Vertebrates (Mrs J. Payne)

Signs of Badgers were reported at Goldsborough Moor Woods.

Entomology (J. H. Flint)

The warm sunny days were ideal for collecting insects, and many were seen, all being typical of lowland Yorkshire. Woodland and woodland margins around Goldsborough yielded several uncommon species. Mr Kendall found the very local fungus beetle *Orchesia undulata* and, under bark, *Cerylon histeroides*. Under moss on very rotten bark Mr Norris discovered an extensive colony of the tiny lace-bug *Acalypta carinata*, so cryptically coloured and seed-like in form that it required his sharp eyes to detect them where I signally failed to discern them. Also taken were the bark beetle *Dryocoetes villosus*, the large hoverfly *Criorhina floccosa* and the red sawfly *Dolerus triplicatus*, the latter being the fourth record for the county. Near the river Mr Kendall had the rove beetle *Lesteva heeri*.

The visit to Allerton Park was less productive, and although Mr Denton had the rove beetle *Acidota crenata* under bark, the other more notable insects were all taken beside the lake. The whirligig beetle here was *Gyrinus marinus*, in some numbers as is usual, and on the mud were the ground beetles *Bembidion clarki*, *B. dentellum*, *Agonum thoreyi*, and the ladybird *Anisosticta 19-punctata*. Mr Payne found a thriving colony of the pretty little grey weevil *Poophagus sisymbrii* feeding on *Rorippa amphibia* at the water's edge.

Although there were plenty of insects at the Ringing Station, all were common species to be expected, but it was nice to see the handsome cardinal beetle *Pyrochroa serraticornis*, the wasp beetle *Clytus arietis* and the leaf beetle *Lochmaea crataegi*.

Hymenoptera (M. E. Archer)

Seven common species of aculeate bees were recorded as follows: *Bombus pascuorum*, queen; *B. terrestris*, queen; *B. hortorum*, queen; *Psithyrus bohemicus*, queen; *Andrena haemorrhoa*, male; *A. chrysosceles*, male; *Lasioglossum fratellum*, female.

Lepidoptera (Mrs J. Payne)

With perfect weather and butterflies flying all the time we were in the field, numbers of the three Whites, Orange Tip, *Anthocharis cardamines*, and Wall, *Lasiommata megera*, looked impressive. A few hibernated Small Tortoiseshells, *Aglais urticae*, and Peacocks, *Inachis io*, were still on the wing. The Small Copper, *Lycaena phlaeas*, was also recorded in both squares.

Trees and shrubs were very free of the defoliating larvae of the early spring geometrid moths on all sites. Early emerging imago moths included the Common White Wave, *Cabera pusaria*, the Common Wave, *C. exanthemata*, the Clouded Border, *Lomospilis marginata*, the Common Carpet, *Epirrhoe alternata*, and the Dwarf Pug, *Eupithecia tantillaria*, which is a larch-feeding species. Especially pleasing to see were two noctuid moths flying in the sun, the Herald, *Scoliopteryx libatrix*, on the Saturday afternoon, and the Small Yellow Underwing, *Panemeria tenebrata*, on the Sunday morning. Larvae noted were Scalloped Oak, *Crocallis elinguaria*, Yellow Tail, *Euproctis similis*, and Garden Tiger, *Arctia caja*.

Flowering Plants and Ferns (Mrs P. Abbott)

The arable fields in Goldsborough were almost weed-free, the only plants of interest being *Lamium hybridum* and *Vicia augustifolia*. In Great Wood there were three saplings of *Carpinus betulus*, but the most interesting place was a small area of marsh to the right of the path just north of Ribston Park. As well as good patches of *Caltha palustris*, there were *Cardamine amara*, *Stellaria nemorum*, *Carex acutiformis*, and *Hesperis matronalis* growing here. In the woodland north of Ribston Hall one plant of *Carex pendula* was seen, and, further on, a small patch of *Ranunculus auricomus*, and *Polygonatum multiflorum* was naturalized.

Almost the first thing seen at Allerton Park was a large stand of *Typha angustifolia* in the lake. In and around the lake there were ten species of sedge, including *Carex acuta* and *C. disticha*. On the lake-side were about twenty emergent fronds of *Ophioglossum vulgatum* and a few small trees of *Populus tremula*. *Scirpus lacustris* was seen through binoculars. *Atropa bella-donna* was not seen, but is known to grow near the church of Allerton Mauleverer.

Along the lanes between Goldsborough and the Knaresborough Bird Ringing Station, the following species were noted: *Cymbalaria muralis*, *Pilosella officinarum*, *Ononis repens*, and *Tragopogon pratense*. At the Ringing Station there were good clumps of both *Caltha palustris* and *Arum maculatum* as well as *Montia sibirica*, *Cardamine amara*, *Veronica filiformis*, *Chrysosplenium oppositifolium*, and *Stellaria nemorum*. A few people walked alongside the river to Knaresborough and saw the hybrid willow, *Salix* x *laurina* (= *S. caprea* x *viminalis*), *Parietaria diffusa*, *Lycium halimifolium*, and several garden escapes, notably: *Chelidonium majus*, *Pentaglottis sempervirens*, *Valerianella locusta*, and *Narcissus majalis*. *Cheiranthus cheiri* covered the vertical rocks at the Knaresborough end of the gorge.

During the visit to Goldsborough Wood, a few plants were added to each square: *Orchis mascula* and *Lysimachia nemorum* to both squares, and *Geum* x *intermedium* and *Polystichum aculeatum* to SE 45.

178 species were recorded in SE 35 and 129 in SE 45.

Mycology (A. Hawkswell)

The following bracket fungi were recorded: *Coriolus versicolor*, *Daedalea quercina*, *Daldinia concentrica*, *Polyporus squamosus*, and *Stereum hirsutum*. *Nectria cinnabarina* was seen, and the Smut fungus *Ustilago violacea* was on *Silene dioica*.

Bryology (Miss J. Robertson)

Conditions were very dry for mosses. On limestone walls in Goldsborough grew *Homalothecium sericeum*, *Tortula muralis*, *Ceratodon purpureus*, *Grimmia pulvinata*, *Bryum capillare*, and *B. argenteum*. In scattered woodlands around Goldsborough Park and Little Ribston Hall were *Brachythecium rutabulum*, *Fissidens taxifolius*, *F. bryoides*, *Mnium hornum*, *Eurhynchium swartzii*, *E. praelongum*, *Rhynchostegium confertum*, *Brachythecium velutinum*, *Amblystegium serpens*, *Rhytidiadelphus squarrosus*, *Hypnum cupressiforme* var. *resupinatum*, and *H. mammillatum*.

Aquatic species on rocks in the River Nidd included *Schistidium alpicola* var. *alpicola*,

Fontinalis antipyretica, *Cinclidotus fontinaloides*, and *Rhynchostegium riparoides*, with *Brachythecium rivulare*, *Cratoneuron filicinum*, *Pohlia delicatula*, *P. wahlenbergii*, and the hepatics *Lunularia cruciata*, *Marchantia polymorpha* and *Riccardia pinguis* along its marshy banks. Examination of mud-encrusted tree boles in the flood zone produced *Tortula latifolia* and the rare *Myrinia pulvinata*.

A visit to Goldsborough Wood, the site of old deciduous woodland, but now replanted, added *Thuidium tamariscinum*, *Atrichum undulatum*, *Calliergon cuspidatum*, *Plagiothecium denticulatum*, *Isopterygium elegans*, *Plagiomnium undulatum*, and the hepatics *Lophocolea heterophylla* and *L. bidentata*.

On paths and walls around Allerton Park were *Orthotrichum diaphanum*, *Bryum bicolor*, *Barbula convoluta*, and occasional *Campylopus introflexus*. *Leptodyctium riparium*, *Pohlia nutans*, *P. carnea*, and *Bryum pseudo-triquetrum* occupied small areas of the swampy lakeside, with occasional *Conocephalum conicum* on stonework, and *Orthodontium lineare* and *Dicranella heteromalla* on one or two patches of dried peat. The epiphytes *Dicranoweissia cirrata* and *Aulacomnium androgynum* were frequent in deciduous woods nearby.

RISE PARK (VC 61), 12 June (B. S. Pashby)

Rise Park, for many generations the family seat of the Bethells, lies roughly half-way between Hull and Hornsea. It consists of mixed woodland and a large area of parkland in which are two lakes, the smaller of which has a good sample of aquatic vegetation. Following a long spell of dry weather, it was our misfortune to encounter rain immediately the meeting commenced. Starting as showers which merged into continuous rain, this did not prevent members from visiting most parts of the Estate.

Tea and the meeting for presentation of reports were at the Leven Cafe, where the President, Mr J. R. Mather, took the chair. Over forty members and associates had attended the excursion and eighteen societies were represented. Thanks were expressed by Mrs Joan Duncan to Mr R. A. Bethell for permission to visit Rise Park; to the proprietors of the Leven Cafe for use of the room for the meeting; to Miss Joyce Robertson for standing in for the Excursions Secretary, Mr Pellant, who was indisposed, and to the Divisional Secretary for organizing the meeting.

Ornithology (J. R. Mather)

In spite of the rain, fifty species were recorded. The lake had several broods of Mallard ducklings, single Gadwall, Shoveler and Tufted Duck, and a pair each of Great Crested Grebes and Little Grebes were seen. A pair of Mute Swans had a nest, and Coot and Moorhen were present. Reed and Sedge Warblers were in song at the lake, and Blackcaps and Garden Warblers in song in the wood, whilst Willow Warber and Whitethroat were seen feeding young.

All the five Corvids were seen, all of which were also represented on the gamekeeper's gibbet, which held twelve Carrion Crows, one Rook, one Jackdaw, four Magpies, and one Jay. The Chaffinch was very common, and Bullfinch and Goldfinch were noted. Goldcrests were singing in the conifers, and family parties of Blue Tits were on the wing. Corn Bunting was heard, and Yellowhammer was fairly numerous along the surrounding roadsides.

Mammals and Other Vertebrates (J. R. Mather)

Only two live mammals were seen, a Rabbit and a Brown Hare, but the keeper's gibbet gave a good indication of the presence of six other species. This held: 15 Weasels, 56 Stoats, 77 Brown Rats, 39 Grey Squirrels, 2 Moles, and 3 white Ferrets, the latter probably having escaped and been subsequently trapped.

Mollusca (L. Lloyd-Evans)

Following the long drought molluscs were scarce and only ten species were recorded. An addition to square 54/14 in the Molluscan Atlas was the Tree Slug, *Limax marginatus*, which is uncommon in VC 61.

Entomology (J. H. Flint)

The meeting had scarcely begun when rain effectively ruined any prospect of collecting insects from the vegetation in any systematic way, so that although there was a good attendance of

entomologists results were meagre and it is not possible to assess the possibilities of the Park for insects. A typical result was that of Mr R. J. Marsh, who worked assiduously to list forty-three species of beetle. All were quite common, widespread species except two. The exceptions were the rather local ground beetle *Bembidion aeneum*, which, typically, he found on the muddy margins of one of the lakes, and *Brachytarsus nebulosus*, which is associated with dead wood. The lake margins were not otherwise very productive.

An extensive keeper's gibbet, usually a rich source of carrion beetles, produced little other than a number of the bright blue *Necrobia violacea*. The best discovery was probably that of the handsome sawfly *Macrophya punctumalbum*, which was taken from ash upon which its larva feeds, and which has only previously been recorded in Yorkshire at Gateforth.

Lepidoptera (Mrs J. Payne)

Surprisingly few butterflies were recorded. The three Whites, *Pieris brassicae*, *P. rapae* and *P. napi*, and the Wall, *Parage megera*, were all singles. Five colonies of Small Tortoiseshell, *Aglais urticae*, larvae were reported on nettles and a single imago seen. No sign of Orange Tip was present.

There were good colonies of the Chimney Sweeper, *Odezia atrata*, on the road verges and in woodland clearings. The ubiquitous Silver-ground Carpet, *Xanthoroe montanata*, was present, as also was the Yellow Shell, *Euphyia bilineata*, a moth which seems to have declined in recent years. A good record was the Clouded Silver, *Bapta temerata*. Larvae of the Leopard Moth, *Zeuzera pyrina*, boring in Spear Thistle stems were found, and one has now pupated in a thistle stem, having failed to bore a pear branch with which it was provided.

Other Arthropods (D. T. Richardson)

Collecting was carried out at the western lake, which contained the isopod *Asellus aquaticus*, and Rise Wood, TA (54) 150410. The wood produced four woodlice: *Oniscus asellus*, *Philoscia muscorum*, *Porcellio scaber*, and *Trichoniscus pusillus*, agg.; three millipedes: *Cylindroiulus punctatus*, *Polydesmus angustus* and *Tachypodoiulus niger*: one centipede: *Lithobius forficatus*, and one harvestman: *Platybunus* (= *Rilaena*) *triangularis*. All are common species found throughout the county, but, with the exception of *Oniscus asellus*, all are new records for TA (54) 14.

I am most grateful to Dr Lloyd-Evans for carrying out the collections in my absence.

Flowering Plants and Ferns (Miss F. E. Crackles)

The Park was entered near Wood Cottage. Woodland species included: *Dryopteris dilatata*, *Stellaria holostea*, *Lysimachia nemorum*, *Circaea lutetiana*, *Ajuga reptans*, and *Lonicera periclymenum*. Fine plants of *Phyllitis scolopendrium* occurred by the side of a small woodland dike, together with three plants of *Polystichum setiferum*, a species only once previously recorded in the vice-county.

An abundance of dwarf plants of *Veronica beccabunga* on one of the main rides with *Angelica sylvestris* at the side of the ride testified to a waterlogged clay soil. Patches of *Holcus mollis* and *Veronica officinalis* by the side of another ride suggested a drier, more acid soil. Nearby in short vegetation, very locally, were plants of *Trifolium micranthum*, a species rarely recorded in the vice-county. The presence of this species and of both *Myosotis discolor* and *Aphanes microcarpa* in another wood clearing are a strong indication of deposits of sands and gravels.

At the edge of the westernmost lake, beds of *Equisetum fluviatile, Lycopus europaeus*, *Scutellaria galericulata*, *Scirpus tabernaemontani*, and *Phalaris arundinacea* were noted, whilst *Myosotis scorpioides*, *Mentha aquatica*, *Juncus inflexus*, *J. effusus*, and *J. effusus* var. *compactus* were frequent, at least locally, and *Ranunculus sceleratus*, *Galium palustre* and *Alisma plantago-aquatica* also occurred. In the lake itself, *Nymphaea alba* is abundant, but presumably introduced, and *Sparganium erectum* formed an extensive belt some yards from the shore. Species noted in the adjacent grassland included: *Stellaria graminea*, *Carex spicata* and *C. remota*, with *Alopecurus geniculatus* and *Carex hirta* occurring in quantity, but very locally.

By the edge of the larger lake, in addition to *Scirpus tabernaemontani*, beds of *Typha latifolia*, *Carex riparia* and *Glyceria maxima* were conspicuous, with *Equisetum palustre* and *Epilobium*

hirsutum also present in quantity. Large rafts of *Polygonum amphibium* in flower on the lake made a fine show.

A newly cut dike through a woodland clearing was examined on the way back to the cars; species occurring included: *Geranium dissectum*, *Epilobium adenocaulon*, *Scrophularia nodosa*, and *Senecio viscosus*. Frequent plants of *Digitalis purpurea* were present in this clearing.

Heavy rain limited the amount of critical examination of the Taxa present, particularly in the vicinity of the two lakes.

Plant Galls (F. B. Stubbs)
The total of eighteen examples was small, but June is early for some galls to be evident. The curled leaf of *Galium aparine*, caused by the mite *Eriophyes galii*, was of interest. This gall was almost eliminated by the drought of 1976, and only recently has it been regaining wide distribution. It would apper that the plant, a flimsy annual, withered before the mite had consolidated its annual life cycle.

Bryology (T. L. Blockeel)
The woodland flora was poor, both in species and number of individuals. *Metzgeria furcata*, almost absent from this part of Yorkshire, was found at the base of one ancient elm. The rides looked as though they might produce a richer, ephemeral flora in the autumn, but at the time of the excursion had only a limited number of species, including *Pohlia wahlenbergii* and plentiful *P. carnea*. Around the edge of the western lake it was pleasing to find *Ricciocarpos natans* in good quantity on mud and decaying vegetation. *Pseudephemerum nitidum*, *Pohlia carnea* c. fr. and *Physocomitrium pyriforme* were also found on the lake margins. The churchyard at the northern edge of the Park had *Barbula cylindrica*, *Thuidium tamariscinum* and *Calliergon cuspidatum*, the latter surprisingly not seen elsewhere during the day. The *Thuidium* was also in pasture nearby, with *Pseudoscleropodium purum* and *Weissia controversa*. *Barbula tophacea* was on moist soil by a pond in the same pasture. A total of forty-eight species was recorded.

MAY MOSS (VC 62), 19 June (Miss J. Robertson)
Dr M. Atherden, who is involved in research work on May Moss, led a party of thirty to investigate this S.S.S.I. As she pointed out, 'It is the deepest area of blanket bog on the North Yorkshire Moors, the peat reaching a maximum depth of 6.3 metres. It covers approximately 100 ha, and consists of two adjacent basins, at the heads of north-flowing Eller Beck and the south-flowing Long Grain, with a narrow interfluvial ridge between them. The site is surrounded on the east, south and west by Forestry Commission plantations of conifers, and adjoins the Fylingdales Early Warning Station to the north. It has been left unplanted by the Forestry Commission, which owns it, because of its botanical interest. There is no public access and the Union visited it by kind permission of the Forestry Commission and RAF Fylingdales.'

In the afternoon, some members were shown the particularly interesting botanical sites in the Hole of Horcum.

After tea at the Saltersgate Inn, the President, Mr J. Mather, took the chair at the Meeting for Reports. Mr K. Payne expressed thanks to the landowners, to the Divisional Secretary and to Dr Atherden for leading the party.

Ornithology (J. R. Mather)
Only thirty-one species were seen, twenty-three of these in the area of the Moss and eight in the Hole of Horcum. Small numbers of Crossbills were the most interesting record, with one party of nine. The most numerous species on the moor edge and the conifer plantations were Lesser Redpoll, Meadow Pipit, Chaffinch and Willow Warbler, all of which were breeding. Wood Pigeons were fairly common in the conifers and Stock Dove was seen.

Mammals and Other Vertebrates (J. R. Mather)
Only two species of mammals were recorded and only one of these was seen. A Roe Deer hind was seen with two fawns, and a single buck was surprised on one of the forest rides. Fox was represented by scats. Other vertebrates seen were Common Lizard and Common Frog.

Mollusca (L. Lloyd-Evans)
On the acid moorland one slug, *Arion subfuscus*, was feeding on Fox droppings, an oasis of calcium and protein in a molluscan desert.

Entomology (J. H. Flint)
A dull, damp start to the day inhibited collecting at first, but conditions later improved considerably, and May Moss proved to be as interesting as anticipated. The results confirmed the view that it rivals Fen Bog as a habitat for insects, and it would repay a good deal of further investigation. Of sixteen ground beetles found by Mr P. Kendall, *Miscodera arctica*, *Patrobus assimilis*, *Pterostichus adstrictus*, *Trichocellus cognatus* and *Bradycellus ruficollis* are typical of high moorlands. Most notable was *Cymindis vaporariorum*, which, although known from these moorlands, appears to have been recorded only once (Rudland Rigg, 1976, JHF) since 1923. To these moorland forms should be added the green tiger beetle, *Cicindela campestris* and the bug *Salda muelleri*.

There was an interesting, and typical, aquatic population in the peat pools which included the bugs *Callicorixa wollastoni* and *Gerris gibbifer* and the beetles *Hydroporus gyllenhali*, *H. melanarius*, *H. morio*, *H. nigrita*, *H. pubescens* and *Rantus bistriatus*. The black *Helophorus tuberculatus* was a pleasing find giving further evidence that so far from being an occasional casual immigrant as opined by Balfour-Browne, it is firmly established on these moors.

Other insects worthy of note are the bright blue shield bug *Zicrona coerulea*, the reed beetle *Plateumaris discolor* and the soldier beetle *Cantharis paludosa*. A eumenid wasp, *Ancistrocerus oviventris*, was discovered by Mr Kendall building and provisioning its nest on the exposed face of a large boulder.

Lepidoptera (Mrs J. Payne)
On this unusual terrain it was remarkable to see larvae of the Vapourer, *Orygia antiqua*, feeding on Cranberry. They were almost full-fed and soon pupated, emerging on 10 July 1982. The Oak Eggar, *Lasiocampa quercus* (presumed var. *callunae*) larvae were plentiful and varied from half- to almost full-size. In the morning they were resting on the highest shoots of Ling, their hairs holding the moisture and giving them an unusual appearance. A single imago was seen of an unusually pale colour. Emperor Moth, *Saturnia pavonia*, larvae were seen, one almost full-grown and the familiar apple green, but many were in earlier stages. Some were still black and red and resting in closely entwined groups at the top of the Heather stems.

In the afternoon the Common Heath Moth, *Ematurga atomaria*, and the less common Grass Wave, *Perconia strigillaria*, were flying in numbers. The Bordered White, *Bupalus piniaria*, was taken among the Pines.

Several members of the party were rewarded by the sight of three Large Heath butterflies, *Coenonympha tullia*, and photographs were taken. This is a new station for this rare Yorkshire butterfly.

Flowering Plants and Ferns (Dr M. Atherden)
The vegetation is dominated by *Calluna vulgaris*, with abundant *Eriophorum vaginatum* and *E. angustifolium* in the hollows and large areas of *Sphagnum* with other bryophytes. There is a considerable amount of *Erica tetralix*, although this has evidently decreased in abundance since 1912, when Frank Elgee described it as commoner than the Ling. A conspicuous and attractive component of the flora was *Vaccinium oxycoccos*, flowering well wherever it was not too heavily shaded by the Ling. *Narthecium ossifragum* grew strongly in several areas, and a few rather small plants of *Drosera rotundifolia* were also seen. *Empetrum nigrum* was found on the drier parts and a few plants of *Trichophorum cespitosum* were recorded.

The most interesting botanical records were for two plants not known from elsewhere in the vice-county: *Andromeda polifolia*, which had finished flowering but was locally common in the central parts of the bog, and *Rubus chamaemorus*, which occupies only one patch of a few square metres; the population appeared healthy, although it has never been seen to flower at the site. The populations of both these species are the subject of a research project which will be reported at greater length in a subsequent issue of this journal.

There are many small pools on the Moss, some of which are shell holes from the last War, when it was used as a missile practice range. One larger pool, Little Ark, was examined and found to be surrounded by *Juncus effusus* with several sedges: *Carex curta*, *C. binervis*, *C. rostrata*, *C. nigra*. This area also produced some rather incongruous records: *Vaccinium myrtillus*, *Rumex acetosella*, *Chamaenerion angustifolium*, and the grasses *Dactylis glomerata* and *Deschampsia flexuosa*. One or two saplings of *Betula pubescens*, *Sorbus aucuparia* and *Pinus sylvestris* were beginning to colonise the bog.

A visit to the north-facing side of the Hole of Horcum confirmed the healthy state of the population of *Chamaepericlymenum suecicum*. Most of the plants had finished flowering, but the stand was impressive and evidently competing well with the neighbouring Bilberry and Bracken. The party then visited the bottom of the Hole and found an interesting group of marshland plants associated with the streamside. These included *Cardamine pratensis*, *Lychnis flos-cuculi*, *Ranunculus flammula*, *Lotus uliginosus*, *Galium palustre*, *Hydrocotyle vulgaris* and *Pinguicula vulgaris*. In the stream itself were *Nasturtium officinale*, *Veronica beccabunga* and *Mentha aquatica*. There were several species of sedges in the Hole: *Carex ovalis* was quite common, as was *C. echinata* in the wetter areas. *C. demissa*, *C. panicea*, *C. nigra*, *C. flacca*, *C. pilulifera* and *C. pulicaris* were also found.

Drier parts of the Hole also had their botanical interest. Two plants of *Ophioglossum vulgatum* were found and several *Gymnadenia conopsea*. *Primula vulgaris*, and *Endymion non-scriptus* were still in flower. Other interesting records were for *Betonica officinalis*, *Lysimachia nemorum*, *Campanula rotundifolia*, *Myosotis secunda* and *M. versicolor*, *Lathyrus pratensis*, *Veronica officinalis*, *Polygala vulgaris*, *Pedicularis sylvatica* and *Dactylorhiza fuchsii*. At the foot of the east-facing side of the Hole was a good stand of *Salix repens*. The effects of Bracken spraying were observed, and the poor regeneration of grasses and other plants in the sprayed areas was noted with some disappointment.

Mycology (W. Bramley)
There was little to report on mycological matters at this meeting. *Lyophyllum palustre* was fairly frequent, and *Galerina paludosa*, *Marasmius androsaceus* and *Collybia dryophila* were the only other agarics recorded.

Dasyscyphus diminutus occurred on *Juncus*, as well as *Endodothella junci*. A few lichens were collected, all on *Calluna*, which have been determined by D. H. Smith: *Cladonia coccifera*, *C. uncialis*, *Lecanora conizaeoides* and *Bacidia chlorococca*.

Bryology (Miss J. Robertson)
Sphagna dominated the bryophyte community on May Moss, with *Sphagnum cuspidatum*, *Drepanocladus fluitans*, *Cephalozia bicuspidata* and *Gymnocolea inflata* in wet hollows, *S. papillosum*, *S. recurvum* var. *mucronatum* and *S. tenellum* forming firmer patches, with rounded clumps of *S. capillifolium* on the driest sites. Towards the centre were dull red patches of *S. magellanicum* in a few places. Frequently interwoven with them were the hepatics *Odontoschisma sphagni*, *Mylia anomala* and *Cephalozia connivens*.

On the steep sides of wet ditches around the bog, between young conifers, were *Calypogeia fissa* and *C. muellerana*, with *Dicranella cerviculata*, *Campylopus pyriformis* and *Orthodontium lineare* occupying the drier peat above. On and alongside the rides surrounding the Moss were *Leucobryum glaucum*, *Dicranum scoparium*, *Polytrichum commune*, *P. juniperinum*, *P. piliferum*, *Pohlia nutans*, *Plagiothecium undulatum*, *Aulacomnium palustre*, *Calliergon cuspidatum* and very occasionally the hepatic *Barbilophozia floerkii*. *Hypnum jutlandicum* clothed *Calluna* stems.

The Hole of Horcum offered a wider range of habitats and the following species were added: on wet, acid soils in the Oak wood along one steep side were *Tetraphis pellucida*, *Atrichum undulatum*, *Amblystegium serpens*, *Isopterygium elegans*, *Dicranella heteromalla*, *Dicranum majus*, *Mnium hornum*, *Lophocolea heterophylla*, *Lepidozia reptans*, *Diplophyllum albicans* and *Lophozia ventricosa*. *Pleurozium schreberi*, *Rhytidiadelphus squarrosus* and *Cephalozia bicuspidata* occurred in the pasture below. The farmhouse ruins were covered with the common species *Brachythecium rutabulum*, *Tortula muralis*, *Funaria hygrometrica*, *Ceratodon purpureus*,

Bryum argenteum, *Barbula unguiculata*, *Eurhynchium praelongum* and *Bryum capillare*. Fruiting *Campylopus introflexus* colonised large areas of bare peat.

Around the stony bed of the small stream and in one or two calcareous flushes were *Cratoneuron filicinum*, *Ditrichum heteromallum*, *Dicranella rufescens*, *Plagiomnium undulatum*, *P. rostratum*, *Bryum pseudo-triquetrum*, *Philonotis fontana*, *Pellia epiphylla* and *Plagiochila asplenioides*.

On the boles of one or two old hedgerow plants of Hawthorn and Ash were *Hypnum mammillatum*, *H. cupressiforme* var. *resupinatum* and *Dicranoweissia cirrata*, with *Leptodontium flexifolium* in one crevice.

Mr T. Blockeel has very kindly acted as referee. *(To be continued.)*

BOOK REVIEWS

The Descent of Darwin by **Brian Leith**. Pp. 174, with 21 figures (line drawings). Collins. 1982. £7.95.

The title of the book, and its sub-title 'A Handbook of Doubts about Darwinism', augmented on the jacket by a drawing of Darwin venturing into an area of crazed and fissured ground, implies that serious flaws in evolutionary theory are about to be demonstrated. References in the text to imaginery 'cohorts' of 'ardent', 'faithful', 'over confident', 'neo-Darwinians' with an 'obsession' and 'pretending they have all the answers', and, like Huxley, oversimplifying evolutionary matters of which the author believes he has a better grasp also carry this implication. The last sentence in the book includes the comment: 'it is not that the theory will be found to be inherently faulty'. There has been a great deal of huffing and puffing on the way to this obvious conclusion, and a great number of errors in both concept and fact. The temptation to discuss more than a few of these errors has been overcome with great difficulty. Damp squib criticisms of 'neo-Darwinism' are repeatedly lit; they do not explode, but the author does not stamp them out. As in a number of recent books the selfish gene concept has been totally mis-represented: 'Why not stick to the whole organism?' the author asks. Because its genome is split up at meiosis — we might patiently explain.

Ten of the eleven chapters have interrogatory titles. Indeed, the interrogation mark is the most overworked punctuation mark in the book. 'Can genes build bodies?' seems scarcely likely to be answerable; genes are referred to by the false metaphor of 'building blocks' at one point: can bricks build a house? 'Can genes learn by experience?' seems a question scarcely worth asking; the chapter of this title includes a reference to the giraffe's neck (not again!). We are asked 'if, say, five genetic mutations are actually necessary to accomplish bodily adaptation (complete with co-ordination of nerve, muscle, bone, blood supply and so on), are we reasonably to expect *all five* to occur at the same time in the same creature?' In fact Gregory Bateson is quoted; he refers to a *single* mutant gene, 'long neck', in the hypothetical pre-giraffe. Single genes affecting allometry are well known, as are multiple genes of cumulative effect. However, the reader is left with the 'difficulty of explaining adaptation by this traditional mutation/selection theory' when, in reality, there is no difficulty.

Non-scientists are mentioned in the first sentence of the introduction; the book is intended for them. The reviewer is a scientist who found that he could scarcely bear to put it down — in anticipation of his next effusion of neo-Darwinian exasperation. DJH

Neo-Darwinism by **R. J. Berry**. Pp. 68. Edward Arnold. 1982. £2.65.

It is now 40 years since the publication of *Evolution: the Modern Synthesis* (Huxley, 1942), which was a definitive statement of the position of evolutionary theory nearly a hundred years after it had been made a science by Charles Darwin. Since 1942 various criticisms of the idea of evolution through natural selection have been advanced, but as Professor Berry shows in this book most of them are objections that have been brought forward and refuted before. He recognizes what he calls 'five episodes of doubt' about Darwinism, and on this basis the Neo-Darwinism described by Huxley would be the 'third synthesis'. Berry demonstrates quite clearly that no 'fifth synthesis' is necessary, and so there is no need for a massive tome on Huxleyan lines. There is however an important place for this slim volume which states the present position so well and stresses the need for evolutionists to be naturalists and not 'closet biologists'. FHB

NOTES ON YORKSHIRE MOLLUSCA — 6 THE STATUS OF *MARSTONIOPSIS SCHOLTZI* (SCHMIDT 1856) IN YORKSHIRE

A. NORRIS
Leeds City Museum

In *The Naturalist* for January-March 1982, a field note records the occurrence of *Marstoniopsis scholtzi* (Schmidt 1856), in Yorkshire. This small freshwater gastropod has never been officially accepted as a member of the Yorkshire fauna, even though its presence has been published previously. Ten specimens were reported as having been found from five sites along the Pocklington Canal from the Bielby Arm to just below Thornton Lock (Lawton *et al*, 1974), as a result of a survey of the invertebrates of the Pocklington Canal carried out by York University in 1973. All ten specimens were, unfortunately, destroyed in a fire at the University before they could be examined by the recorders. Several trips to the canal since that date have failed to find any evidence of its occurrence.

I was pleased therefore to be able to have the opportunity to examine the specimens collected by Dr P. J. Hogarth on 5 October 1981 from the small stone cistern in the vicinity of Fountains Abbey in North Yorkshire (Hogarth, 1982). All the material forwarded to me, and now in my care, proved to be immature specimens of the common freshwater species *Potamopyrgus jenkinsi* (Smith, 1856).

Marstoniopsis scholtzi (= *Bythinella scholtzi* (Schmidt 1856)) can be distinguished from *Potamopyrgus jenkinsi* by the fact that *scholtzi* has an open umbilicus whilst in *jenkinsi* it is closed (see Macan, 1977). This can be observed even in half-grown specimens.

Marstoniopsis scholtzi cannot therefore be accepted as a member of the Yorkshire fauna.

Acknowledgement

I would like to thank Dr P. J. Hogarth for allowing me to examine the specimens, thus enabling me to put the record straight.

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FURTHER RECORD OF *CRASPEDACUSTA SOWERBYI* LANKESTER IN LANCASHIRE

E. G. HANCOCK

Four examples of the freshwater medusa *Craspedacusta sowerbyi* Lankester were brought into Bolton Museum as an enquiry on 22 July 1982. Mr S. Jones of Little Lever, Bolton, had observed and then collected them in the short, self-contained Bolton branch of the Manchester-Bolton-Bury canal. Since the collapse of the bank lower down the system in 1936, water has been maintained in this section and it is heavily used as a resource by the local populace and anglers.

The existence of a freshwater medusa startled the scientific world in 1880. It was assumed, not unreasonably, that jellyfish were confined to marine habitats. Since that date a voluminous bibliography has been built up, as is usually the case with rare or unusual events, and this is listed in Russell (1953). The first discovery was made in the water lily tanks in Kew Gardens. Plants from Kew were sent to the Sheffield Botanic Gardens and *C. sowerbyi* was recorded from there

also (Lankester, 1893). In the meantime, staff at Kew Gardens had adopted a very anti-zoological practice of washing out the tanks at the end of each year. This interesting coelenterate was subsequently reported in various parts of Western Europe, wherever the Victoria or Giant Water Lily (*Victoria amazonica* (Poepp.)Sow.) had been imported from Brazil, the native haunt of this species. Colonization of 'natural' waters occurred and in the British Isles *C. sowerbyi* was established in Devon, Gloucestershire and Monmouthshire by 1949. There have also been records of jellyfish in freshwater aquaria. These could have been introduced directly with imported plants and fish from the country of origin. Seyd's (1967) account involving the Manchester Museum aquarium may be an example. In other cases, as described by Kidd (1956), the use of locally collected weed to decorate tanks can be the cause of the sudden appearance of medusae in a display of Angel fish and guppies.

Kidd's observations record that the medusae had originated from the polyps, or hydroid stage, which were found to be numerous on *Elodea* in the Rochdale Canal as it passes near Oldham. In the account given in Grzimek (1974) the first discovery of the polyps is stated to be from among stones and mollusc shells in running water (no date or further reference given). The hydroid is able to form a cyst, in which stage it is resistant to dehydration and could be dispersed by natural means.

The temperatures at which the sexual form (the medusa) is produced vary from 20–25.5°C according to Russell (1953). The normal temperature of a tropical fish aquarium is 25–25.5°C. In south Lancashire there are now considerably fewer warm-water lodges associated with textile mills than formerly but there are still areas, such as the now famous Church Street stretch of the St Helens Canal, into which hot water is returned (from Pilkington's Glass Works). Here various species of tropical fish breed, illustrating the possibility of continual reintroduction or transfer of plants and animals through the activities of the aquarium industry (Lever, 1977). The evidence seems to point to anglers and aquarists as being responsible in the main for the spread or maintenance of *C. sowerbyi.*

Samples of weed, water and substrate from the canal in Little Lever are being maintained in a separate tank in the Bolton Museum Aquarium. Although no polyps have been seen on this material it is hoped that medusae will reappear in 1983. Mr Kidd (*pers. comm.*) says that subsequent to the occurrence of *C. sowerbyi* in Oldham in 1952, the canal became polluted and this species has not been seen there again. Therefore, the colony in Bolton may be the only current occurrence of this interesting animal in the north of England.

ACKNOWLEDGEMENT

Mr S. J. Moore for providing references for records of *C. sowerbyi* in the British Isles.

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Russell, F. S. (1953) *The Medusae of the British Isles*. Cambridge.

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FIELD NOTE

Formica fusca L. **(Hymenoptera: Formicidae) at Coatham Sands** W. A. Ely reports *F. fusca* from Holme upon Spalding Moor (YNU Excursion, *Naturalist* **107**: 109). On 26 May 1979 I found a colony of *F. fusca* under a piece of wood in the dune meadow at Coatham Sands, Teesside (NZ 575256). The *Provisional Atlas* (Biological Records Centre) shows that most records of *F. fusca* are from south of a line Humber-Ribble but it also occurs in Western Scotland.

D. Horsfield

THE FLORA OF THE EAST RIDING OF YORKSHIRE: PROGRESS REPORT

EVA CRACKLES
143 Holmgarth Drive, Bellfield Avenue, Hull HU8 9DX

'A Flora of the East Riding of Yorkshire', vice-county 61 (Fig 1) is being prepared. Maps are being constructed on a tetrad (2 km × 2 km) basis for all but the rarest species and it is hoped that it will be possible to publish most of these; uncommon species will be recorded in the usual way, ie specifying the nearest village.

A first draft of a considerable part of the annotated list section of the flora has been written, although some information has still to be incorporated.

The mapping scheme is an ambitious one as there are 848 tetrads wholly or partly in the vice-county. Tetrad maps have been constructed for about 400 species of vascular plants using all the information available. The construction of such maps is eminently worthwhile, greatly increasing one's knowledge of plant distribution which a less ambitious scheme would not have done. The number of species so far recorded for each tetrad is given in Fig 1.

I would be grateful for help with inadequately covered areas and for recent records of uncommon species from botanists visiting the vice-county as well as from those resident here. I would like to complete the field-work in the next two seasons. Accurate identification is essential but a reliable list, no matter how short, for an under-worked tetrad would be valued. Finally, may I request that everyone respects the property of others and asks permission before botanizing on private land.

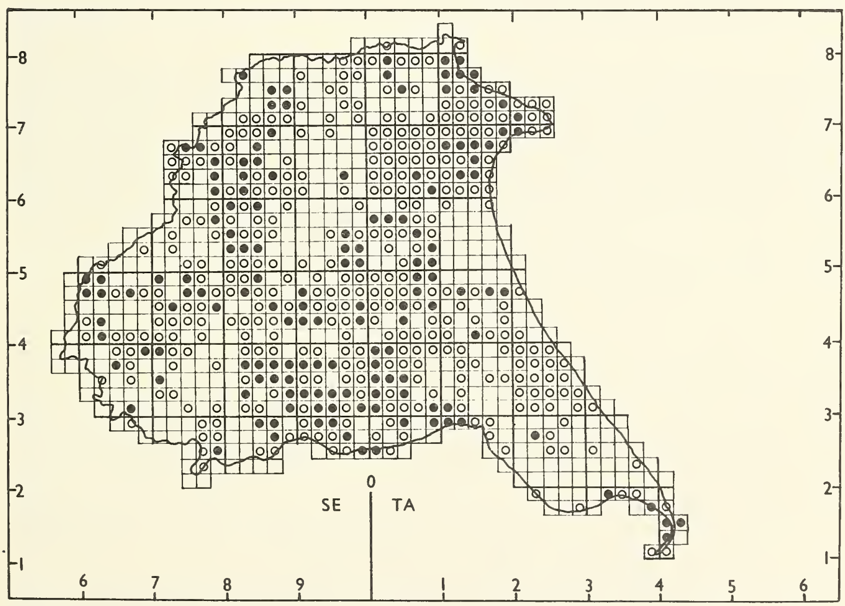

FIGURE 1
South-east Yorkshire (VC 61): progress map of vascular plant recording at tetrad level. ▣ good coverage (more than 170 species); ◙ moderate coverage (100–170 species); □ underworked (less than 100 species).

BOOK REVIEWS

Adventures with Insects by **Richard Headstrom**. Pp. 220, with illustrations by the author. Dover Publications. 1963, republished 1982. £3.40.
A chatty ramble through an assemblage of pieces of information about the lives, habits and structures of American insects. It would be a pleasant ramble for the text reads easily and in America it may well be informative about the insects one is likely to see. However, so many of the forms selected are totally unfamiliar in Britain and the illustrations so often of an incredibly unrecognizable crudity that one wonders how the publishers could think it a useful addition to the British market.

JHF

Shallow-water Crabs by **R. W. Ingle**. Pp. viii + 206, including numerous line drawings and tables. Synopses of the British Fauna (New Series) No. 25. Published for the Linnean Society of London and The Estuarine and Brackish-water Sciences Association by Cambridge University Press. 1983. £20 hardback, £8.95 paperback.
Latest contribution to this excellent series, containing keys, detailed notes and illustrations for the identification of the forty-nine species of true crabs inhabiting intertidal and onshore waters of the British Isles. Introductory chapters deal with such topics as the biology, distribution and classification of these crabs; a glossary, an extensive list of symbionts and parasites, and an impressive list of references add to the usefulness of this work.

Seashells of the Arabian Gulf by **Kathleen Smythe**. Pp. 123, including 18 line drawings, plus 20 plates (8 in colour). Allen and Unwin. 1982. £9.95.
The Arabian Gulf is an area of water linked to the Indian Ocean via the Gulf of Oman, and guarded by the Straits of Hormuz. It is surrounded on all sides by the oil-rich states of the Middle East and is the world's most important super-tanker highway. In recent years an attempt has been made to study the flora and fauna of the Gulf, and to assess the effects of all this traffic, and its inevitable oil spillages, on the marine and inter-tidal environments.

This volume on the sea shells of the Arabian Gulf will therefore be very valuable both to the professional as well as the amateur shell collector. It describes just over 300, mostly inter-tidal and shallow water species of which approximately half are illustrated by either photographic plates or line drawings. This is the first popular book on the sea shells of the Arabian Gulf and as such will create its own demand. My only complaint is the quality of the colour plates: these are poor, being far too dark, and compare very unfavourably with the high standard of colour plates we now demand in this type of publication.

AN

Australia's Great Barrier Reef by **Robert Endean**. Pp. 348, including 299 colour photographs, several maps and line drawings. University of Queensland Press. 1982. $29.95 Aust.
Dr Endean, a world authority on the Australian Great Barrier Reef, has produced a scientific work on its biology, beautifully and clearly illustrated, often with twelve photographs to a page. The colour photographs will aid in identification of both animals and plants found on the Reef. Dr Endean has listed details of families (except for some groups which are dealt with at higher levels of classification) and common genera under chapter headings such as 'The Reef builders — Algae' and 'The Molluscs'. Future plans are revealed of producing a series of books in which species belonging to each family of animals are to be discussed.

Initially Dr Endean intended to write for biologists and biology students but was persuaded to write for a general audience. This work is too large to be used as a field guide and is more erudite than a glossy book. The text is clear, interesting and informative. However, Chapter 19 'Dangerous animals found on coral reefs' falls short in not providing illustrations or references to illustrations within the work to dangerous animals. For example we read on page 251 of the danger of the Stonefish but there is no reference to illustration 269 on page 261. As this work is aimed at a general audience the need to prepare tourists for the Reef's danger would have been

enhanced by this chapter being fully illustrated with coloured photographs. It could then be read as a complete unit without the need to search for illustrations for purposes of identification.

It is surprising that there is no list of references at the end of the chapters or at the end of the publication to refer readers to other important works in this area. While so much has been written on the Reef, even if more popular works were listed for the general reader with a reference to Frankel, E. *Bibliography of the Great Barrier Reef Province*. Canberra, Australian Government Publishing Service, 1978 for the student and scientist, this would be useful.

Apart from these criticisms, Endean's work is a valuable, impressive contribution to life on the Reef. It will delight any serious lover of nature whether at the Reef, or if opportunity does not present itself, in an armchair imagining the Reef's beauty and fascination from afar.

DMcC

Machair Under Threat by **J. Graeme Robertson**. Pp. 40, including 7 figures and 4 tables. Habitat Scotland, Portree. 1982. £2.50 paperback (available from: Blaven Park, Portree, Isle of Skye).
Publication highlighting the varied developments threatening the important machair habitat of the Western Isles, and the essential baseline data and monitoring required for a comprehensive environmental impact assessment which would 'modify project designs to meet environmental needs without necessarily prohibiting the crofters plans for improvement'. Further details from, and donations to, the address shown above.

The Use of Land Classification in Resource Assessment and Rural Planning by **Roger S. Smith**, Pp. 43, including tables, figures and plates (some in colour), £3, and **Vegetation Change in Upland Landscapes** by **D. F. Ball**, **J. Dale**, **J. Sheail** and **O. W. Heal**, Pp. 45, including tables, figures and 16 b/w plates, £2. ITE/NERC, Cambridge. 1982.
Latest publications of the Institute of Terrestrial Ecology, which include considerable primary source and reference data, being of particular interest to ecologists, environmentalists and geographers.

Plants of the Bible by **Michael Zohary**, Pp. 223, with many full colour illustrations. Cambridge University Press. 1982. £9.50.
Historical information and botanical description of 130 plants, each lavishly illustrated with habit and/or habitat photographs, by the foremost botanist of the eastern Mediterranean region. Introductory matter (including maps) on the topography, seasons, climate and the vegetal landscape and agriculture of biblical times, as well as a glossary, bibliography and index of biblical references, add to the scholarship of this handsome book.

A Field Key for Classifying British Woodland Vegetation Pt I by **R. G. H. Bunce**. Pp. 103, with 32 maps and 32 photographs. Institute of Terrestrial Ecology, Cambridge. 1982. £3.
An ITE publication based on an analysis of 1648 plots from 103 woodland sites distributed throughout the British mainland. This classification of woodland vegetation is novel on three counts. Firstly, it is based on a well defined sampling procedure with the data being collected especially for it. Secondly, it is based, as its title implies, not only on the occurrence of trees but also on the understorey species and ground vegetation on the premise that it is these components which are the integrated reflection of the conditions in the particular woodland rather than just the trees themselves. This aspect takes a little getting used to since the vegetation types do not have tree species in their names, but it soon strikes one as being quite logical. The final difference between this and other approaches is that 'it is minimally dependent on subjective judgements'. In practice the whole classification process is handed over to a computer program TWINSPAN, so that all pre-conceptions are that of the program, or the way it is employed, and not the ecological experience of those who undertook the project. The result is thirty-two woodland vegetation types (TWINSPAN splits the data sent into two then each of the two parts into two again and so on five times). The major drawback with this process is that the splitting does not result in thirty-two types with similar internal variability. The thirty-two types are concisely described with their constant species etc, a photograph of a 'typical' example, geological and soils data, and a distribution map. As one might expect this classification does not correspond very well with those of more subjective workers such as Kiell and Lund, Hartman,

Jahn, Durin, Tuxen & Brown Blanquet but the authors do try to indicate the relationship between the work of some of these and their own. TWINSPAN has the advantage that it writes a very workable key to its own classification but this is only useful if the end product, the final types, is worth reaching. Usage will show whether this is the case and in the meantime we can look forward to Part II which will integrate the data used in this classification, that of the sample plots, with descriptions of whole woodlands.

JEPC

Fossils, Minerals and Rocks — Collection & Preservation by **R. Croucher** and **A. R. Woolley**. Pp. 60, with 14 b/w photographs and 5 line drawn figures. Cambridge University Press. 1982. £3.25.

The two authors, who are both geologists working at the British Natural History Museum, have produced an introductory guide for people wishing to develop a well-preserved and curated collection of fossils or rock specimens. Sound, if rather basic, advice is given on suitable equipment, safety and sources of information. After this rather elementary introduction to journals, maps and recording information, the book moves onto a rather higher plane when it deals with the preservation of materials. The techniques suggested for the conservation, repair and preparation of specimens sometimes involve the use of rather expensive equipment such as ultrasonic tanks, airbrasives and dental equipment, which are not likely to be available to the novice collector, and some of the preservation techniques involve rather complex procedures using specialized chemicals and materials. Wisely, they have included a short section which lists the hazards posed by these materials.

One very useful feature of the book is the section listing manufacturers and suppliers of the items mentioned in the text. There is a short list of suggestions for further reading and an index. The sections on preservation are likely to be of interest to active palaentologists and mineral collectors, but overall it may well give an impression of complexity which may tend to deter novices from entering the field.

DEC

Slopes and Weathering by **R. J. Small** and **M. J. Clark**. Pp. 112, with numerous maps, diagrams and b/w photographs. Cambridge University Press. 1982. £6.95 hardback, £3.25 paperback.

Though slopes may be regarded as the most basic of landforms, few geomorphological textbooks deal adequately with them at an introductory level. This book competently fills that gap, and it is to be hoped that the modest price of the paperback edition will enable students and interested laymen to acquire a working knowledge of this field more easily than hitherto. The book provides an adequate account of weathering debris movement. However, its strong point is a simple yet clear exposition of the various hypotheses of slope evolution, and its coverage of the relative importance of climate and rock type in slope development. In addition, it provides a clear introductory account of the problems associated with measuring and describing slopes and of the techniques which may be used to provide the data for slope analysis. The illustrations are generally well chosen. Unfortunately, at least two references are incorrectly cited but despite this, the book should prove useful to geomorphology students.

DEC

The Peak District by **I. M. Simpson**. Pp. 120, with numerous maps, tables and b/w photographs. Unwin Paperbacks. 1982. £3.95.

This admirable introductory guide provides background information and fifteen clearly presented half-day or full-day geological field excursions within the Peak District. The excursions range from Kinderscout in the north to lower Dovedale in the south. Though many are in well frequented areas, a few are in remoter areas. Almost all are readily accessible from public rights of way. Abundant grid references and clear descriptions enable the itineraries to be easily followed. In addition to the excursion guides, there is a twelve-page guide to the geology of the area, a glossary of geological terms and some useful suggestions for further reading. This slim volume is an admirable guide which should assist walkers, naturalists and visitors to the Peak District to more fully appreciate the character of the physical landscape.

DEC

IMPORTANT ANNOUNCEMENT
'THE BULLETIN'
A new publication from the Yorkshire Naturalists' Union

The YNU has decided, after much debate within its various committees and after the recent Conference of Affiliated Societies, to produce a new publication to be called the Bulletin of the Y.N.U. This publication will replace the Newsletter edited by Mr H. T. James. It is hoped to publish two issues of the Bulletin each year in the spring and the autumn. At present the Y.N.U. can afford to produce each edition with up to 40 pages using a format of folded A4 and photoreduced type. The first edition is planned for spring 1984.

It is hoped that a name can be found for the Y.N.U. Bulletin and a competition has been initiated to find a suitable name. The name should preferably consist of one word. A book prize kindly offered by the editor of the *Naturalist* will be given to the person suggesting the best name. Every entry must be accompanied by a brief field note which should be suitable for publication in the Bulletin. All entries and field notes should be sent to the editor of the Bulletin (address given later).

It is intended that the Bulletin should publish both news items of immediate interest and also papers and articles of more permanent value. The Bulletin will also be the organ for liaison between the Affiliated Societies and provide a publishing outlet for the smaller Affiliated Societies who do not have their own publication.

In particular the Bulletin hopes to have regular and submitted features. The following is a list of the kinds of topics that might be included: ideas for other kinds of topics are welcomed.

Regular features

1. Details of forthcoming meetings, including Y.N.U. field meetings. It is hoped we can revert to the system of providing background information on the geology, climate and natural history of the area to be visited.
2. Reports of recent indoor and field meetings.
3. Details of current publications including cost, contents and address from which the publication can be bought. The content of the current *Naturalist* could be given.
4. Abstracts of important decisions taken by Union Committees.
5. Reports on national natural history, e.g. from *Habitat.*
6. News from the Yorkshire Naturalists' Trust.
7. Informal reports of a Section's activities during the past year, two years, six months, etc.
8. Brief field notes and observations — it is hoped that this feature will become an important part of the Bulletin so that important findings may be published quickly.
9. Help with surveys.
10. Advertisements of workshops, courses, recently published books, etc.
11. How to begin a particular natural history study — how and when to collect and/or observe, equipment and supplies needed (costs and addresses), literature, regional and national experts, reference collections, etc.
12. Letters from natural historians.

Submitted features

1. Papers on natural history from the north of England (particularly from Yorkshire) which are not suitable for the *Naturalist.*
2. Articles on the search for, and natural history of, a single species or closely related group of species.
3. Reports of surveys.
4. Information about a particular Section or Affiliated Society — history, present officials, past personalities, present activities and personalities.

Material for the Bulletin should be sent to the editor, **John Spencer, 15 Northfield Close, South Cave, Brough, North Humberside HU15 2EW**. It would probably greatly improve the channels of communication if each Section and Affiliated Society appointed a correspondent to liaise with the editor of the Bulletin.

I hope you will support the Bulletin and send in your regular and submitted features. In particular for the Spring 1984 edition please send details of your summer meetings, reports of your winter meetings, details of current publications, field notes and observations and letters of topical natural history interest.

Dr M. E. Archer, Chairman of the Publication Committee

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Edited by M. R. D. SEAWARD, MSc, PhD, DSc, FLS, The University, Bradford

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THE YORKSHIRE NATURALISTS' UNION

Notice to Contributors to 'The Naturalist'

Manuscripts (two copies if possible), typed double-spaced on one side of the paper only with margins at top and left-hand at least 2.5 cm wide, should be submitted. Latin names of genera and species, but nothing else, should be underlined. S.I. Units should be used wherever possible. Authors must ensure that their references are accurately cited, and that the titles of the journals are correctly abbreviated. Tables and text-figures should be prepared on separate sheets of paper. Drawings and graphs, drawn about twice the linear size they are to appear, should be in jet-black Indian ink, and legends should not be written on the figures.

Subscription rates: Issued free to individual members of the Yorkshire Naturalists' Union and to Affiliated Societies.

Institutions and Subscribers £9.50.

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Chequer Road
Doncaster DN1 2AE

200 YEARS OF ACID RAIN

MALCOLM PRESS, PATRICIA FERGUSON and JOHN LEE
Department of Botany, The University, Manchester M13 9PL

Few ecological issues have attracted as much public interest as acid rain in recent years, and reports of acidity and its possible consequences are frequent in both the scientific and popular press. With increasing energy consumption in Western European countries (present levels are expected to double over the next 20 years) (Chadwick 1983), concern regarding ecologically sensitive areas is mounting. However, for one area of Britain, predicted fears for the future are belittled by events of the past. Striking vegetation changes have been recorded in the Peak District moorlands over the past 200 years, as a consequence of atmospheric pollution. These changes are probably the largest in Britain, to date, that can be ascribed to this cause.

Over 52,000 ha of Peak District moorland occupy the area bounded by the margins of Greater Manchester, Rochdale, Huddersfield, Barnsley and Sheffield, at the southern end of the Pennine range. The region includes extensive areas of blanket peat bogs which were initiated about 7,000 years ago, with the onset of a wetter climate and an increase in the level of prehistoric human activity. Blanket bogs are rarely situated close to the development of heavy industry and dense populations, and this combined with the fact that the area has been at the centre of a great industrial region for over 200 years probably makes the Southern Pennines unique in the annals of air pollution. Even before that the region was subject to local atmospheric pollution as a result of mining and smelting. Pollution continues today. Despite the decline in industrial activity more people live within a 90 km radius of the Longendale Valley than within a 90 km radius of central London.

Evidence for vegetation change may be obtained by the indentification of plant remains, which are preserved in the peat (Conway 1947, 1954). The presence of soot can also be identified as a dark horizon in the surface layers (Tallis 1964). A more vivid impression of the situation even at the turn of the century is provided by C. E. Moss (1901), in an account of the local flora published in *The Naturalist*: 'Let us picture the view of the Lancashire towns as one stands on some of the bold western escarpments of the Pennines . . . Deadly suburban fields form the most extensive element of the background; but what rivets the eye are the scores, and scores again, of mill chimneys, tall, straight and lank, belching forth volumes of black, dense smoke, straight at the rocks on which we stand! . . . The great smoke drifts from South and East Lancashire could be seen crossing over the Pennine range of moorlands and then mingling with the West Riding smokes. Examples of "black rain" at considerable distances from larger towns are well known . . . the influence of smoke on the Pennine moorland was more than subsidiary.'

Accounts of the natural history of the area published in the late 18th and early 19th centuries provide a record of the plants present in the region before the effects of the Industrial Revolution were fully felt. A catalogue of plants in the Halifax area produced by the Rev. J. Watson in 1775 enabled C. E. Moss, a century and a quarter later, to comment on the disappearance of a number of species. The losses included the bog myrtle *(Myrica gale),* the sundew *(Drosera intermedia),* the lesser twayblade *(Listera cordata)* and the white beak sedge *(Rhyncospora alba).* In 1835 in his *New Botanist's Guide,* H. C. Watson described the bog rosemary *(Andromeda polifolia)* as 'abundant in all that group of mountains that separates Yorkshire from Lancashire'. Today the plant is extremely rare in the southern Pennine hills.

The bog-mosses *(Sphagnum* species) are the principal peat-forming plants and a vital component of bog ecosystems, and their dominance in the southern Pennines before the Industrial Revolution is inferred in an account of *The Agriculture and Minerals of Derbyshire,* by John Farey, commissioned by the Board of Agriculture, between 1811 and 1817. A century later in his account of *The Vegetation of the Peak District,* C. E. Moss recorded 18 species of *Sphagnum* occurring on the moors of the southern Pennines, only two of which he described as rare. By 1964, only five species were listed as growing on the southern Pennine moorlands (Tallis 1964), of which only one was at all common. Today, local patches of *Sphagnum* are found on the East and South-West Moors (principally one species, which has been shown to be very

much less sensitive to atmospheric pollutants, particularly sulphur, than some of the others), whilst the North-West Moors, the worst affected, are almost totally devoid of the plants.

Sphagnum species were not the only mosses to suffer. Mosses do not have roots, and many species rely on atmospheric inputs for their mineral nutrients, which are absorbed directly through their leaves. These leaves, usually only one cell thick, lack the cuticle which protects the leaves of higher plants and so are particularly exposed to atmospheric pollutants. In 1866, writing in *The Naturalist,* J. Nowell noted the disappearance of a considerable number of mosses from the Todmorden area, and connected this with 'the super-abundance of factory smoke'. Lichens also succumbed, and in his 1859 *Manchester Flora,* L. H. Grindon suggested that the dearth of lichens in the area was attributable to 'the influx of factory smoke, which appears to be singularly prejudiced to those lovers of the pure atmosphere'. Lichens and mosses have long been used as important biological pollution indicators, and their paucity in the southern Pennine moorlands today is perhaps the most striking aspect of the vegetation. These moors are now dominated by cotton-grass *(Eriophorum vaginatum)* and bilberry *(Vaccinium myrtillus).* The monotony of the landscape, and the lack of colour and variety provided by the common moorland plants that are to be found elsewhere in Britain, are apparent even to the most casual observer. Even the best known of all moorland plants, the common heather *(Calluna vulgaris),* has been in decline over the past hundred years.

At the same time as the naturalists were giving an account of vegetation changes, early investigations of air and rain quality were providing evidence of the nature of the polluted atmosphere, in the nineteenth and early twentieth centuries. Observations of rainfall chemistry date back to the early 18th century, although these principally concerned themselves with rain salinity. The earliest account of atmospheric sulphur pollution was presented by R. A. Smith to the Manchester Literary and Philosophical Society in 1852, in a paper entitled 'On the Air and Rain of Manchester'. Smith commented that 'all the rain was found to contain sulphuric acid in proportion as it approached the town', but although he made a detailed study of several sites on the outskirts of Manchester, he did not consider the southern Pennine uplands. A year later, the first continuous set of measurements began at Rothamsted, an unpolluted rural site in southern England. Records of the sulphate content and the pH of rain water are not complete, but whilst the former may have doubled over the last hundred years, a fall in the latter has only been observed in the last decade or two (Brimblecombe & Pitman 1980). The situation in the southern Pennines, however, would have been very different. The sulphur content of rain at Garforth, 11 km east of Leeds in 1909 was five times that measured at Rothamsted (Crowther & Ruston 1911), and the pH was probably at least as low as 4.2, compared with a figure of 4.7 twenty-one years later at Rothamsted, when pH measurements were first recorded. Many areas of Pennine moorland are at a similar distance downwind of large industrial towns, and must at least have equalled the Garforth figure in 1909.

It is appropriate that the early pioneering work on atmospheric pollution should have been undertaken in the industrial North of England. By the outbreak of World War I in 1914, the systematic operation of deposit gauges had begun at a number of sites, mainly in the Manchester and Sheffield areas. The monthly figures from these sites were published in *The Lancet* until 1916, for the problem was so severe that even the relatively pollution-tolerant human population was suffering. (After 1916 the columns of *The Lancet* were filled with even more dramatic accounts of suffering on the battlefield.) In 1927, despite remarkable achievements in smoke abatement (several industrial towns had already reduced the 'total deposited matter' in their gauges by 50% since 1914), polluted air was recognised to be a national problem, and the Department of Scientific and Industrial Research set up the Atmospheric Pollution Research Committee with responsibility for co-ordinating the air and rain monitoring efforts of local authorities and other bodies. Statutory restrictions on such practices as firing colliery spoil followed in the 1930s, but soon environmental improvement had once more to take second place to the war effort. Perhaps because of this, or perhaps because the removal of sulphur dioxide from emissions is a more complicated and costly procedure than the removal of smoke, little change in urban sulphate deposition rates was observed in this region between 1927 and 1952. The network of monitoring stations became more extensive during this period, although still largely confined to urban sites, and, apart from the rain chemistry figures from Rothamsted,

little information is available concerning rural air and rain quality. There are isolated measurements during the 1940s which show that open-country sites between Manchester and Sheffield were experiencing annual mean sulphur dioxide concentrations of at least half those recorded in the towns themselves. Whilst city centre concentrations of 900 to 1600 parts per billion (ppb) sulphur dioxide were being measured in Manchester, Sheffield and Huddersfield, the country areas had concentrations in the order of 700-800 ppb (Ferguson & Lee 1983). The consequences for the southern Pennine moorlands of their association with industrialisation and urbanisation can begin to be recognised; while rural moorland and upland sites elsewhere in Britain had yet to face the consequences of 'acid rain', the southern Pennines had been subjected to the 'black rain' described by Moss for over 100 years.

After 1952, improved and standardised methods of measuring atmospheric sulphur dioxide enabled a wider range of urban and rural sites to be included in the national network and the Warren Spring Laboratory became responsible for co-ordinating its results. Sulphur dioxide concentrations began to fall rapidly – a process which continues today in the towns of the North-West. In spite of this the 1969-70 winter means at two semi-rural sites, Holmfirth and Hollingworth, were 315 and 294 ppb respectively, with a substantial number of days at each site when 1300 ppb was exceeded. Experiments have shown that 350 ppb of sulphur dioxide severely restricts the growth of *Sphagnum* (Ferguson, Lee & Bell 1978), and it is almost certain that the higher concentrations occurring even 30 years ago in the moorlands would have been lethal to some of these mosses. The dominant cotton-grass in the southern Pennines has been shown to be resistant to sulphur dioxide, and concentrations of 800 ppb had no adverse effect on the growth of the plant (Crittenden 1975).

With the emphasis in 1954 firmly on sulphur dioxide, rain chemistry was largely abandoned in this country and was left to the European Air Chemistry Network and later the Organisation for European Co-operation and Development, which had a mere handful of sites in Britain (and none in the southern Pennine region) of which hardly any were operated continuously. It is only recently that U.K. interest in the phenomenon of 'acid rain' has been revived, and a number of individual studies have suggested that a significant downward trend in pH can be detected in rural rain in England and Scotland. Whereas in earlier days attention was confined to urban areas, it is now difficult to find published figures for urban rain chemistry, and in any case it is not easy to compare the widespread 'acid rain' of today, a relatively weak solution with little buffering capacity, with the 'black rain' of the past, in which there was a much larger amount of dissolved matter. Our own measurements at a moorland site in the southern Pennines have demonstrated that, today, acid rain is falling here as it apparently does elsewhere in Britain, Scandinavia and parts of North America. The annual means at this site for the 1979-1981 period have been 4.09, 4.01 and 4.19 respectively and weekly figures as low as 3.5 are not uncommon. The last time a range of rain chemistry figures for the area was published was in 1954, when for the years 1950-54 the small southern Pennine towns of Holmfirth, Marsden, Marple, Saddleworth and Slaithwaite recorded rain pH means of 5.6, 4.7, 4.2, 5.0 and 4.4, considerably higher than our present-day findings, but presumably accompanied by larger amounts of suspended solids and altogether a more strongly buffered solution. We can only speculate on the pH of the rain that fell in the early part of this century and before that, but the potential for high acidity was certainly there in the smoke and flue gases emitted from the mill chimneys and domestic hearths.

As well as sulphur pollutants, nitrogen plays an important role in the determination of rain pH. Measurements of nitrogen in rain began in the middle of the last century, when J. B. Lawes, J. H. Gilbert and E. Pugh presented an account 'On The Sources of the Nitrogen of Vegetation' to the Royal Society in 1860. Data from Rothamsted and North America collected since then show a marked increase in the deposition of nitrate (Brimblecombe & Stedman 1982), and this suggests that today nitrate may contribute almost as much to the acidity of the rainfall as sulphate. Information concerning the nitrogen content of air and rain in the southern Pennines over the past two centuries is sparse, but recent measurements show that present day deposition rates for nitrate together with atmospheric nitrogen dioxide concentrations in the southern Pennines are approximately twice those recorded at other upland and moorland sites. Experiments have shown that the bog-moss *Sphagnum* is capable of responding physiologically

to nitrate-enriched rain in the southern Pennines (Press & Lee 1982), and the rise of nitrogen pollutants may play a part in excluding the plant from the area today.

Although the widespread incidence of acid rain in parts of the northern hemisphere has now been conclusively demonstrated, it is currently a matter of considerable debate as to what effect if any this has on ecosystems. However, controversy over the effects of atmospheric pollutants on plant growth is nothing new; in the columns of *The Naturalist* in 1901 Dr. F. A. Lees claimed that 'they (the smokes) are harmless enough to our lovely moortop wildings; smoke on Swill Hill diluted with a world of fresh air must be a very minus quantity and an ineffective figment at 1200 feet above the sea where the cloudberry lives'. Moss of course did not agree with him, and in a spirited rejoinder denounced his arguments as 'a mere *ipse dixit*'.

Another naturalist, Albert Wilson, reported to the British Association for the Advancement of Science in 1900 on 'The great smoke-cloud of the North of England and its influence on plants'. He described the 'miserable condition of the vegetation in some parts of the area' and compared the effect of smoke on mosses and hepatics with that on higher plants. He found a 'great diminution in their abundance and luxuriousness in the neighbourhood of large towns'. In February 1891 there was a long-continued smoke fog, and Wilson pointed out that smoke was at its maximum in winter, when many mosses are growing. In attempting to assess the impact of acid rain, moorlands must represent high risk areas, if only because of their higher-than-average rainfall. Blanket bogs, with a vegetation dominated by the sensitive bog-mosses and relying directly on inputs of nutrients from the atmosphere must be particularly susceptible. Their conservation is important from many viewpoints – ecological, hydrological, recreational and in some parts of the world economic. Perhaps this is a reason why we should not treat the acid rain of today with the contempt shown by Dr. F. A. Lees for the 'black rain' of the past.

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BOOK REVIEWS

Grasshoppers by **Valerie K. Brown,** with plates by **Judith G. Smith.** Pp. 65, with 4 colour plates and numerous illustrations. Naturalists' Handbooks 2. Cambridge University Press. 1983. £8 hardback, £2.95 paperback.

This is an excellent book covering the 21 species of the Acrididae and Tettingonidae, the grasshoppers and bush crickets. Considering the size of the book, a very detailed account is given of life-history studies, covering ecological, physiological and behavioural aspects backed up by 101 references to books and papers. Useful suggestions are put forward to continue the study of the living animal in the laboratory and the field. Very well illustrated keys are given to the five families of British Orthoptera and to the 21 species, of which 17 species are beautifully illustrated by colour plates. The habitat preferences and geographical distribution of the species are included besides techniques on collecting and culturing, addresses for supplies of equipment and requests for help. A must for the serious beginner and for many an experienced amateur.

MEA

Solitary Wasps by **Peter F. Yeo** and **Sarah H. Corbet,** with colour plates by **Anthony J. Hopkins.** Pp. 65, with 8 plates (4 in colour) and numerous illustrations. Naturalists' Handbooks 3. Cambridge University Press. 1983. £8 hardback, £2.95 paperback.

This is an excellent little book covering the solitary wasps of the groups Scolioidea, Sphecoidea and the Eumenidae of the Vespoidea. A useful introduction to the behaviour of this group is given, dealing in some detail with the genera *Passaloecus, Cerceris* and *Ammophila*. Some very useful and simple suggestions are made for further observational studies. However, the major feature of this handbook is the keys to the species. After some ingenious keys to recognise the various groups of the Hymenoptera and some quick-check keys to the genera there follow really well-illustrated keys to the species, including *Psen unicolor* which has only recently been added to the British list. All species are keyed except for the five species of *Spilomena,* male *Pemphredon* and three other species which being based on old records are probably now extinct. A check list with geographical distribution is appended plus 29 references. Techniques on collecting and handling specimens for identification are also included. The colour plates are excellent. This is a book for the serious beginner who wishes to be introduced to this group and then move onto more detailed works. Such a book has been needed for a long time and this is the book I have been waiting for.

MEA

Two further titles published in this new series are: Naturalists' Handbook 1 – **Insects on Nettles** by **B. N. K. Davies,** with plates by **Brenda Jarman,** and Naturalists' Handbook 4 – **Insects and Thistles** by **Margaret Redfern,** with plates by **Anthony J. Hopkins** (same length, style and prices as the two titles reviewed above).

The Butterfly Gardener by **Miriam Rothschild** and **Clive Farrell.** Pp. 128, with 8 colour plates and numerous black-and-white illustrations. Michael Joseph/Rainbird. 1983. £7.95.
An excellent introduction to butterfly gardening, both outdoors and indoors in a heated greenhouse. Miriam Rothschild with much enthusiasm and from her own experience shows how to lay-out a garden and a meadow to attract butterflies that will visit and breed. In particular the cultivation of wild flowers is described in some detail. Clive Farrell of the London Butterfly House gives all the technical details of getting the warmth, humidity, light and ventilation correct in a greenhouse for breeding and maintaining tropical butterflies. Which plants to grow and butterflies to breed besides how to deal with pests and parasites are covered in a most expert way. Clive Farrell suggests that good results can be obtained with a greenhouse only 8ft x 10ft. Appendices give details of British butterflies with caterpillar food plants and nectar plants for adults, easy-to-breed tropical butterflies with caterpillar food plants, details of cultivating outdoor butterfly flowers, egg sterilization procedure and useful addresses. A very good book for the enthusiast and beginner who wants to garden so as to attract and breed butterflies.

MEA

Animal Physiology by **Roger Eckert** (with chapters 13 and 14 by David Randall). Pp. 830, numerous line drawings. W. H. Freeman, San Francisco. 1982. Second edition. £29.95 hardback, £17.50 softback.
Physiologists who set out to write definitive textbooks of their subject have a hard row to hoe these days; the field is enormous and still growing rapidly, and the competition from other textbooks is keen. But the rewards too are high, for a good textbook of physiology that rings bells with those who teach the subject at high school or college level is bound to sell well, and to be reprinted fairly frequently if authors and publishers keep their wits about them. Here is just such a textbook; first printed five years ago, it has taught advanced animal physiology to several cohorts of students, and now appears in expanded and up-dated guise to teach several more. Good luck to it; it is an excellent example of the near-best in American texts – earnest, painstaking, lucidly illustrated, with plenty of examples, references to whole animals (as well as to bits and 'preparations' of them), end-of-chapter summaries, thought-provoking exercises and references. With an unusually full index thrown in, this is excellent value at the soft-cover price. Clear enough for A-level students, it is just right for first- and second-year college and university courses, and one that even an advanced physiologist might be glad to keep on the shelf for quick reference.

BS

Animal Taxonomy by **H. E. Goto.** Pp. iv + 60 with 36 figures. Arnold. 1982. £2.50 paperback.
This account emphasises the wide range of techniques available to animal taxonomists. No longer need classification be based solely on structural features. In this volume the reader is introduced to chemotaxonomy, immunotaxonomy, behavioural taxonomy and cytotaxonomy as well as the elaborate multivariate techniques available for handling many characters simultaneously. A useful, enlightening and stimulating account.

MJD

Evolution from Molecules to Men edited by **D. S. Bendall,** on behalf of Darwin College, Cambridge. Pp. xiii + 594, including 84 figures and 22 tables. Cambridge University Press. 1983. £18.
'Evolution from molecules to men' – a volume based on twenty-six papers by distinguished specialists sandwiched between a Prologue by A. F. Huxley and an Epilogue by J. Passmore – *must* be of interest to all biologists. Inevitably some papers, to be fully appreciated, demand a degree of background knowledge which generalists and specialists in other fields will not have. The papers are presented in four sections, headed Evolutionary history, Molecular and cellular evolution, Evolution of whole organisms and Evolution of social behaviour. They were read at the Darwin Centenary Conference held at Darwin College, Cambridge in 1982. Only the title evokes an adverse criticism from this reviewer: it places *Homo sapiens,* by implication and inappropriately, on an evolutionary pinnacle.

DJH

THE LICHEN FLORA OF DERBYSHIRE — SUPPLEMENT 2

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Since 'The lichen flora of Derbyshire' (Hawksworth 1969) and its 'Supplement 1' (Hawksworth 1974) were published, numerous additional records have been made in the north of the county. In this paper eighty-three lichens new to VC 57 are reported together with details of others which are rare or interesting. This increase is the result of intensive recording in under-worked habitats. There are several signs that the general lichen flora is responding to declining sulphur dioxide levels. For example there has been a general increase in the luxuriance of foliose species and an abundance of new young thalli adjacent to parent plants. In Derbyshire and adjoining counties the fruticose genera *Evernia*, *Ramalina* and *Usnea* are starting to invade willow-carrs by long distance dispersal, and it is suspected that this will soon be observed in other habitats.

The largest number of new species has come from the Millstone Grit. Particularly important here has been the discovery, by B. W. Fox, of *Lecidea pernigra* and *Vorarlbergia renitens*, both from the New Mills area and both new to Britain. In Chatsworth Park boulders carrying well developed populations of *Bryoria fuscescens* and *Usnea subfloridana* have been found under oaks in what is interpreted as having been a refugium throughout the industrial period. A similar history is suggested for the recently discovered population of *U. hirta* on Millstone Grit in Ladybower Wood. New *Cladonia* species include *C. fragilissima* from acid grassland above the Snake Pass (fourth record for England) and the rediscovery of *Cladonia gracilis* at several sites. The northern component in the lichen flora has been increased by the addition of *Fuscidea kochiana*, *Lecidea furvella*, *Ochrolechia frigida* and a second locality for *Umbilicaria torrefacta*.

The Magnesian Limestone at Creswell Crags and Markland Grips has been explored for the first time and proved rich in calcicoles such as *Bacidia arceutina*, *Caloplaca cirrochroa*, *C. isidiigera*, and *Leproplaca* spp. Churchyards and walls in that area provided first records of the eastern species *Caloplaca teicholyta*, *Lempholemma chalazanellum* and *Rinodina teichophila*, and the first modern record of *Collema limosum*. The Carboniferous Limestone, which must now be regarded as one of the more underworked habitats in the county, has rarely been visited, though Back Dale from which recent records of *Peltigera leucophlebia*, *Polyblastia cupularis* and *Solorina spongiosa* have been made is clearly one of the richer sites.

The small basalt intrusions which cut through the limestone are not well exposed, but spurred on by Brian Fox a special effort has been made to locate long abandoned quarries and natural outcrops which are often no more than a line of scattered boulders in a field. The result has been six new species. *Rhizocarpon oederi*, *Stereocaulon pileatum*, *S. vesuvianum* and *Trapelia obtegens* are locally abundant and supported by species such as *Lecidea gelatinosa* on turf edge and *Opegrapha gyrocarpa* in sheltered crevices.

Epiphytes were well covered in the previous Flora and Supplement so new species were only encountered in specialized habitats. Sheltered elms have yielded fragments of the Calicion hyperelli containing *Calicium viride*, *Chaenotheca trichialis*, *Dimerella diluta*, *Opegrapha varia* and *O. vermicellifera* while oak and sycamore in the Limb Valley on the edge of Sheffield have proved rich in small *Bacidia* and *Micarea* species. An unusual find there was *Micarea pycnidiophora*, previously known only from a few woods along the south coast. *Mycoblastus sterilis*, a species believed to be spreading in Britain, is still of only local occurrence in Derbyshire. Trees contaminated with alkaline dust from quarries and cement works have proved to be exceptionally rich in epiphytes with such SO_2 pollution sensitive species as *Caloplaca cerina*, *C. flavorubescens*, *Parmelia elegantual* and *Ramalina fraxinea* present (Gilbert 1976).

Possibly the most important discovery has been an unexpectedly rich terricolous lichen flora associated with lead mines (Gilbert 1980). This habitat may be of national significance. Long undisturbed, ungrazed or only lightly grazed rakes support luxuriant macrolichens such as *Cetraria islandica* (four sites), *Cladonia arbuscula*, *C. cervicornis* subsp. *verticillata*, *C. glauca*, *C. subulata*, *Leptogium teretiusculum* and *Stereocaulon nanodes*. Lead spoil heaps which are heavily grazed or have been disturbed by reworking have a flora dominated by microlichens. From them minute species such as *Polyblastia gelatinosa*, *Steinia geophana*, *Vezdaea aestivalis*, *V. retigera* and *V. rheocarpa* have been recorded, and from Tideslow Rake the very rare

Verrucaria melaenella which elsewhere occurs only in National Nature Reserves was collected.

In 1979 a mid-nineteenth century lichen collection from Chatsworth was discovered in the library there (Gilbert and Pearman 1981). Labelled 'Scott's Mosses' twelve of the forty-two local lichens it contains predate the previous first known record and a further four, *Alectoria nigricans*, *Cladonia foliacea*, *Pannaria pezizoides* and *Pertusaria lactea*, are new to Derbyshire.

The total number of lichen species now recorded from VC 57 stands at 443 of which 340 have been seen since 1960.

The following list summarizes records of Derbyshire lichens accumulated during the period 1974 — April 1983. Nomenclature follows the current checklist (Hawksworth *et al.* 1980). Species not mentioned in the Flora or Supplement 1 are preceded by an asterisk (*). All records include the 10 km square grid reference and entries of the more notable species are closed by indicating where herbarium material may be consulted. BM = British Museum (Natural History), London. E = Royal Botanical Garden, Edinburgh. IMI = Commonwealth Mycological Institute, Kew. SFD = Weston Park Museum, Sheffield. My own records are marked (!).

Acarospora scyphulifera* Vainio **19: on iron-rich band in the Millstone Grit, Alport Castles 1975! (BM, IMI). Det P. W. James.

Agonimia tristicula (Nyl.) Zahlbr. **17**: Miller's Dale Quarry 1979! (SFD). Basalt outcrop near Litton 1980! **57**: on the Magnesian Limestone at Markland Grips 1980! and Creswell Crags 1981!

**Alectoria nigricans* (Ach.) Nyl. On the moors (Derbyshire) 1845 *Scott.*

Arthonia spadicea Leighton **28**: on oak, Ladybower Wood 1981! **29**: on ash, Parkin Clough 1981!

Arthopyrenia* cf. *cerasi* (Schrader) Massal. **17: on elm, Flag Dale 1975 *Hawksworth* (IMI). Det. T. D. V. Swinscow.

Aspicilia caesiocinerea* (Nyl. ex Malbr.) Arnold **17: low basalt outcrops, Dam Dale, Peak Forest 1981 *Fox*; basalt, Potluck Vent, Peak Forest 1981 *Fox.*

Bacidea arceutina* (Ach.) Arnold **57: sheltered, vertical Magnesian Limestone, Creswell Crags 1981! (SFD).

Bacidia delicata* (Larbal. ex Leighton) Coppins **38: at base of sycamores, Limb Valley 1980! (E). Sterile so separation from *B. arnoldiana* difficult.

B. rubella (Hoffm.) Massal. New earliest record. Matlock 1846 *Scott.*

B. vezdae* Coppins & P. James **27: elm, Stoney Middleton 1975! (IMI). **38**: sycamore boles, Limb Valley 1980! (SFD).

Bacidia* sp. (undescribed) **17: dust contaminated sycamore, Chee Dale 1975! (E); sycamore, Deep Dale 1983! (SFD).

Bacidia* sp. (undescribed) **17: terricolous, White Rake near Wardlow 1977! (E).

Baeomyces roseus Pers. **07**: floor of sandstone quarry, Goyt's Bridge 1980! **16**: heather moorland, Blake Moor, Newhaven 1977! (SFD).

Bryoria fuscescens (Gyelnik) Brodo & D. Hawksw. **26**: still present at the Chatsworth site where it is abundant on several sandstone boulders and the bases of oaks in the S.W. corner of the Old Park 1981, 1982 *Fox.* **27**: a tiny specimen on alder, Padley Wood 1974 *Earland-Bennett.*

Calicium glaucellum* Ach. **26: on hard lignum of standing and fallen oaks, Old Park, Chatsworth 1981! (SFD). Previous records of *C. abietinum* should be placed here.

C. viride Pers. Occasional on sheltered elms. **18**: Yorkshire Bridge 1981! **27**: Calver 1979! (SFD). **28**: Priddock Wood 1981!

Caloplaca cerina* (Ehrh. ex. Hedw.) Th. Fr. **27: Stoney Middleton, twigs of dust impregnated ash trees 1975!

C. cirrochroa (Ach.) Th. Fr. **57**: sheltered Magnesium Limestone, Markland Grips 1980! Creswell Crags 1981 *Purvis.*

C. decipiens* (Arnold) Blomb. & Forss. **06: Limestone wall, top of Horseshoe Dale 1983! **16**: asbestos roof, Monyash 1983! **17**: bole of dust impregnated ash tree, Wormhill 1975!

C. festiva (Ach.) Zwackh New earliest record. **26**: on sandstone, Chatsworth 1844 *Scott.*

C. flavorubescens* (Huds.) Laundon **27: Stoney Middleton, on dust impregnated ash trees 1975!

C. flavovirescens (Wulfen) Dalla Torre & Sarnth. New earliest record. **26**: Chatsworth 1845 *Scott.*

C. isidiigera* Vězda Probably overlooked. **16: limestone memorial, Monyash Churchyard 1983!

57: Creswell Crags 1980! Common in most churchyards on the Magnesian Limestone 1983!

C. luteoalba (Turner) Th. Fr. New earliest record. Chatsworth 1845 *Scott.*

C. teicholyta* (Ach.) Steiner In several churchyards on the Magnesian Limestone. First record **46: Scarcliffe 1983!

Candelariella reflexa* (Nyl.) Lettau **18: at base of dust impregnated trees, Bradwell 1974!

C. vitellina* f. *flavovirella* (Nyl.) A. Henderson **18: sandstone memorial, Hope Churchyard 1982! In most churchyards on the Magnesian Limestone 1983!

**Catillaria sphaeroides* (Dickson) Schuler Derbyshire, Sheet 1694.52 Smith Herb. (LINN).

Cetraria islandica (L.) Ach. Now known from the limestone heath at four sites. **15**: quarry, Parwich Moor 1977! **17** & **27**: Longstone Moor 1972 *P. Wathern* & ! **18**: lead rake by roadside, Bradwell 1976 *T. C. Elkington & B. Pendlebury* (IMI, SFD).

Chaenotheca trichialis* (Ach.) Th. Fr. **27: rare on elms, 1 km south of Calver 1979! (SFD).

Chrysothrix candelaris (L.) Laundon New earliest record: on the bark of oak (Derbyshire) 1845 *Scott*. **26**: still present on several oaks in the Old Park, Chatsworth 1981! **07**: ash tree, Deep Dale 1981 *Fox*. **15**: near Tissington Station 1979 *Fox*.

Cladonia arbuscula (Wallr.) Rabenh. Still present in the limestone heath. **10**: Magpie Mine, Sheldon 1975! (SFD). **15**: Parwich Moor 1977! **17**: Longstone Moor 1977!

C. bacillaris* auct. Only known from the limestone heath. **15: Parwich Moor 1977! **16**: Magpie Mine, Sheldon 1975! **17**: Tideslow Rake, Little Hucklow 1977! **27**: Longstone Moor 1977! (SFD).

C. cervicornis* (Ach.) Flotow subsp. *verticillata* (Hoffm.) Ahti Heavy metal soils. **17: Tideslow Rake, Tideswell Moor 1977! **18**: Moss Rake, Bradwell Moor 1977! (SFD).

C. ciliata Stirton Known only from the limestone heath. **15**: Parwich Moor 1977! **16**: Magpie Mine, Sheldon 1976! (SFD). **17**: Longstone Moor 1977!

C. fragilissima* Østh. & P. James **19: acidic grassland, Oyster Clough, Snake Pass 1979! & *Purvis*. Third English record (SFD).

C. glauca* Flörke **15: Parwich Moor 1976! (SFD). **16**: Magpie Mine, Sheldon 1978! **27**: Gardom's Edge 1982!

C. gracilis (L.) Willd. In pockets among acid boulders. **25**: Bonsal Moor 1976! **27**: Bar Brook 1983! **28**: Ladybower Wood 1975! Previously regarded as extinct.

C. luteoalba* A. Wilson & Wheldon Associated with most major outcrops of the Millstone Grit. First record **27: Padley Wood 1974 *P. M. Earland-Bennett* (HFX).

C. parasitica* (Hoffm.) Hoffm. **26: oak stumps and logs, Old Park, Chatsworth 1981 *Fox*.

C. scabriuscula (Delise) Leighton **17**: Tideslow Rake, Tideswell Moor 1977! First record for forty years. Possibly seriously overlooked on lead spoil.

C. subulata* (L.) Wigg. Overlooked in acidic hatitats on the gritstone, basalt and mine workings. First record **28: Ladybower Wood 1975!

Collema auriculatum Hoffm. New earliest record. **16**: wet limestone rocks on the Lathkill 1830 *J. E. Bowman* (MANCH).

C. limosum (Ach.) Ach. **57**: on soil, Whitwell Churchyard. Previously considered possibly extinct in the county. 1983! (SFD).

C. polycarpon Hoffm. New earliest record, **16**: wet limestone rocks on the Lathkill 1830 *J. E. Bowman* (MANCH).

C tuniforme (Ach.) Ach. **16**: abundant on asbestos roof, Monyash 1983! Probably the first record from asbestos in Britain (SFD).

Coniocybe furfuracea (L.) Ach. About the roots of oaks. **26**: Chatsworth Old Park 1982! **27**: Abney Clough 1973! Previously considered probably extinct.

Dermatocarpon miniatum (L.) Mann **27**: abundant, crags on the north side of Coombes Dale 1983!

Dimerella diluta* (Pers.) Trevisan **17: frequent on boles of large woodland elms, east end of Chee Dale 1983! (SFD).

Dirina repanda (Fr.) Nyl. f. *stenhammarii* (Fr. ex Stenhammar) Clauz & Roux **57**: vertical, shaded, Magnesian Limestone, Creswell Crags 1981! & *Purvis*.

Fuscidea kochiana* (Hepp.) Wirth & Vězda **07: sandstone boulders, Combs Edge 1982 *Fox* & !

**F. praeruptorum* (Du Rietz & Magnusson) V. Wirth & Vězda In at least eight sites on slightly

sheltered, horizontal sandstone surfaces. First record **27**: Chatsworth Edge 1978! & *Purvis*.

Huilia soredizoides (Lamy) Hertel Frequent on basalt, 1981–82, *Fox*.

Hypocenomyce caradocensis* (Leighton ex Nyl.) P. James & G. Schneider **07: on oak, Stake Side, Errwood Valley 1980! & *Fox* (SFD). **26**: on hard lignum of standing and fallen oaks, Old Park, Chatsworth 1982!

Lecania cyrtella* (Ach.) Th. Fr. **17: common on the dust contaminated bark of mature trees, Miller's Dale Village 1974!

**Lecanora albescens* (Hoffm.) Branth & Rostrup Previously overlooked. Ubiquitous on highly alkaline materials such as fresh mortar, asbestos and cement!

L. chlarotera Nyl. New earliest record. **26**: on wood, Chatsworth 1845 *Scott*.

L. epanora* (Ach.) Ach. Siltstone blocks in walls. **27: Moorhall 1974 *P. M. Earland-Bennett* (HFX). **35**: Hare Edge 1974 *P. M. Earland-Bennett* (HFX).

L. gangaleoides* Nyl. Not uncommon on vertical gritstone faces and basalt outcrops. First record **28: Ladybower Wood 1975!

L. subaurea* Zahlbr. In a dozen sites, mostly near the base of walls or in rocks by streams. First record **18: roadside wall, Edale 1973 *P. R. Stewart* (HFX).

**Lecanora* sp. Undescribed sorediate crust (K + bright yellow, Pd + pale yellow, C^-) abundant on the Magnesian Limestone. Markland Grips 1980! Creswell Crags 1981 *Purvis*. Whitwell Village 1983! Scarcliffe Church 1983! (SFD).

Lecidea aeruginosa* Borrer Overlooked. **07: rhododendron bough, Errwood Hall, Goyt Valley 1980 *Fox*. **26**: hard lignum, Chatsworth Park 1982!

L. furvella* Nyl. ex Mudd Occasional on the Millstone Grit. First record **19: Cowms Rocks 1979!

L. gelatinosa* Flörke **17: turf edge over basalt, Litton 1982!

L. immersa (Hoffm.) Ach. **07**: Back Dale 1981! & *Purvis* (SFD). **27**: Coombes Dale 1983!

L. pernigra* Hertel **08: on horizontal surface of sandstone boulders, Cracken Edge Quarry near Chinley, 29 April 1979 *Fox*. First British record (BM, E).

L. plana (Lahm) Nyl. **07**: Combs Edge, 1982 *Fox* & !

Lecidella scabra (Taylor) Hertel & Leuckert **57**: frequent on the Magnesian Limestone at Markland Grips 1980! and Creswell Crags 1981 *Purvis*.

Lempholemma chalazanellum* (Nyl.) Zahlbr. **57: mortar of wall, near Creswell Crags 1983! (SFD).

Lepraria membranacea auct. **28**: locally abundant on vertical sandstone faces, Ladybower Tor 1981!

L. zonata* Brodo Occasional on the Millstone Grit. First record **27: Padley Wood, 1974 *P. M. Earland-Bennett* (HFX).

Lepraria* sp. (undescribed green taxon). **57: deep crevices in limestone, Markland Grips 1980! and Creswell Crags 1981!

Leptogium schraderi (Bernh.) Nyl. New earliest record. **25**: Matlock Bath 1783 Table 2284 *Eng. Bot.* (Smith & Sowerby 1811). **57**: cliff ledge, Markland Grips 1980! (SFD). **07**: Deepdale, 1981 *Fox*.

L. teretiusculum* (Wallr.) Arnold On heavy metal soils. **17: top of Haydale 1977! (SFD). **18**: Daisy Rake, Bradwell Moor 1976!

L. turgidum (Ach.) Crombie **17**: recent fluorspar workings, Longstone Moor 1977! (SFD). **57**: mortar of wall, near Creswell Crags 1983! (SFD).

Micarea denigrata* (Fr.) Hedl. Overlooked. **17: elms, Millersdale Village 1976! **38**: sycamore bough, Limb Valley 1980 ! (SFD).

M. melaena (Nyl.) Hedl. Overlooked. **26**: abundant on shaded tree stumps and logs, Chatsworth Park 1982! **38**: Limb Valley 1980!

M. nitschkeana* (Lahm ex Rabenh.) Harm. **38: elder, Limb Valley 1980!

M. peliocarpa* (Anzi) Coppins & R. Sant. **17: on decaying vegetation, Longstone Moor 1976! (SFD).

M. prasina* Fr. Previously overlooked, known from eight sites. First record **27: elm, Stoney Middleton 1975! (IMI).

M. pycnidiophora* Coppins & P. James **38: base of oak, Limb Valley 1980! (E). Previously only known from a few old woodlands in southern England.

Mycoblastus sterilis* Coppins & P. James This Species appears to be spreading. **07: rowan, Errwood Valley, Stake Side 1980! & Fox (SFD). **19**: rowan, near Black Clough, Longdendale 1981! **27**: sycamore, Sheffield Plantation, Longshaw 1981! **38**: sycamore, Limb Valley 1980! (SFD).

Ochrolechia frigida* (Swartz) Lynge **28: Hurkling Stones, Derwent Edge 1976! Southern-most record in the Pennines.

O. parella (L.) Massal. Still unaccountably rare in Derbyshire. **07**: sandstone by the weir, Taxal Reservoir 1983 *Fox*.

O. tartarea (L.) Massal. In very small amount on several sandstone outcrops. **27**: on a single boulder, north end of Chatsworth Park 1978! & *Purvis*. **28**: on one boulder below Ladybower Tor 1977!

Opegrapha gyrocarpa* Flotow **17: sheltered basalt outcrop, Litton 1982! & Fox.

O. varia* Pers. **27: rare on elm, 1 km south of Calver 1979! (SFD).

O. vermicellifera* (Kunze) Laundon **27: rare on elm, 1 km south of Calver 1979!

O. vulgata* (Ach.) Ach. **17: frequent on boles of large woodland elms, east end of Chee Dale 1983!

Pannaria pezizoides* (Weber) Trevisan **26: Chatsworth Park 1845 *Scott*.

Parmelia caperata* (L.) Ach. **26: on trees, old Park (Chatsworth) 1845 *Scott*.

P. discordans* Nyl. Occasional on gritstone west of Sheffield. First record **26: Old Park (Chatsworth), in fruit 1845 *Scott*.

P. elegantula* (Zahlbr.) Szat. **16: bole of dust impregnated sycamore, Chelmorton 1982! (SFD).

P. exasperatula* Nyl. **16: wall overhung by sycamores, 1.3 km south of Arbor Low 1974!

P. pastillifera* (Harm.) R. Schubert & Klem. **16: limestone wall overhung by trees 1.3 km south of Arbor Low 1974!

**Peltigera hymenina* (Ach.) Delise Previous records of *P. polydactyla* should be placed here.

P. leucophlebia* (Nyl.) Gyelnik **07: rare, on low limestone outcrops, Back Dale 1981 Margaret Shaw (SFD).

**P. membranacea* (Ach.) Nyl. Previous records of *P. canina* should be placed here.

P. spuria (Ach.) DC. New earliest record. **26**: Old Park (Chatsworth) 1845 *Scott*.

**Pertusaria lactea* (L.) Arnold First substantiated record: Buxton 1845 *Scott*.

P. pupillaris* (Nyl.) Th. Fr. The specimen of *Lecidea cinnabarina* (Hawksworth 1974) from **27: on oak, Highlow Brook 1973, has been redetermined as this species.

Petractis clausa (Hoffm.) Krempelh. **17**: lower end of Monk's Dale 1979 *Purvis* (SFD).

Phaeophyscia nigricans* (Flörke) Moberg **57: perching stone, Cresswell Crags 1981! (SFD).

Phlyctis argena (Sprengel) Flotow **17**: low basalt outcrops, Dam Dale 1980! & *Fox*.

Physcia dubia* (Hoffm.) Lettau **18: not uncommon in dust impregnated habitats, Bradwell area 1975!

Physconia pulverulacea Moberg New earliest record: on moors, Buxton, 1845 *Scott*.

Platismatia glauca (L.) Culb & C. Culb. New earliest record. On stone (Derbyshire) 1845 *Scott*.

Polyblastia albida Arnold **07**: Errwood Hall Estate, 1980 *Fox*. **17**: basalt outcrop, Litton 1982! & *Fox*.

P. cupularis Massal. **07**: limestone, Black Dale 1980 *Fox*; concrete Goyt Valley 1980 *Fox*. First modern records, previously considered possibly extinct.

P. dermatodes Arnold **16**: Monyash Village, 1978 *Fox*. **57**: Cresswell Crags 1981!

P. gelatinosa* (Ach.) Th. Fr. **16: ledge of basalt outcrop, Chelmorton 1983! **25**: alkaline lead spoil, Leys, Slaley 1976!

Polysporina simplex (Davies) Vězda **18**: sandstone, Castleton Churchyard 1976! (IMI).

Racodium rupestre Pers. **07**: Deep Clough, Goyt Valley 1980 *Fox*. Much rarer than *Cystocoleus ebeneus*.

Ramalina fraxinea (L.) Ach. **18**: a few thalli on bough of dust contaminated ash tree, Aston 1976! Previously considered extinct.

Rinodina gennarii Bagl. New earliest record. Near Buxton 1845 *Scott*.

R. teichophila* (Nyl.) Arnold In most churchyards on the Magnesian Limestone. First record **57: Whitwell 1983!

Rhizocarpon oederi* (Web.) Körber Widespread but local on Millstone Grit and basalt. First record **19: Cowms Rocks 1979! & *Purvis* (SFD).

R. riparium* Räsänen **27: Millstone Grit boulders, Padley Wood 1974 *P. M. Earland-Bennett* (HFX).

Rinodina exigua (Ach.) Gray **14**: elm, Osmaston 1968 *Hawksworth* (IMI).

Sarcosagium campestre* var *macrosporum* Coppins & P. James Not uncommon on recently disturbed lead spoil. **17: Tideslow Rake, Tideswell Moor 1977! **18**: White Rake, Longstone Moor 1977! (SFD). **25**: Leys, Slaley 1976! (SFD).

Scoliciosporum umbrinum (Ach.) Arnold Widespread on basalt, concrete and eutrophicated sandstone!

Solorina spongiosa (Ach.) Anzi **07**: occasional on low limestone outcrops, Back Dale 1981! Second modern record (SFD).

Staurothele hymenogonia (Nyl.) Th. Fr. **07**: mortar of outbuildings, Errwood Hall 1980 *Fox*. **08**: cement, Chapel-en-le-Frith Churchyard 1977 *Fox*.

S. rupifraga (Massal.) Arnold **17**: Mill Cottage, Dam Dale 1981! & *Fox* (SFD).

Steinia geophana* (Nyl.) Stein. Probably overlooked. **17: recent fluorspar working, Longstone Moor 1977! (SFD).

Stereocaulon nanodes* Tuck. **26: mine spoil, Mill Close Mine, Darley Dale 1974. *P. D. Crittenden* (IMI); mine spoil, Clough Wood, Wensley 1979! (SFD). **16**: sandstone kerbs of graves subject to drip from rusty iron railings, Monyash Churchyard 1983! (SFD), basalt outcrop, Chelmorton 1983!

**S. pileatum* Ach. Locally abundant on most basalt outcrops 1979–82 *Fox* & !

S. vesuvianum Pers. Commoner than the records indicate. Known from sixteen sites on basalt, sandstone walls, etc. New earliest record. **26**: on stone, Old Park, Chatsworth 1845 *Scott*.

Thelidium microcarpum* (Davies ex Leighton) A. L. Smith. **57: Magnesian Limestone, Creswell Crags 1981! (SFD).

Toninia lobulata (Sommerf.) Lynge. **57**: soil covered ledge, Markland Grips 1980! (SFD).

Trapelia involuta (Taylor) Hertel Widespread on the top of slightly sheltered Millstone Grit boulders!

T. obtegens* (Th. Fr.) Hertel Previously overlooked. Not uncommon on basalt and fine grained, damp sandstone. First record **18: Castleton Churchyard 1976!

Umbilicaria deusta (L.) Baumg. **27**: by the stream in Padley Gorge 1975 *P. M. Earland-Bennett*. **28**: intermittently irrigated rocks beside track, Ladybower Wood 1978!

U. polyrrhiza (L.) Fr. **28**: well established on one rock, Ladybower Wood 1976!

U. torrefacta (Lightf.) Schrader **27**: a few small plants at north end of Gardom's Edge 1982! Southern-most locality in the Pennines.

Usnea hirta* (L.) Wigg. **28: abundant on a sandstone boulder in Ladybower Wood 1983! & party. First record from the Midlands (SFD).

Usnea subfloridana Stirton **26**: abundant on several boulders in oak woodland, Old Park, Chatsworth 1982 *Fox* (SFD). This appears to be a refugium site. **27**: a few small thalli on willows by the River Derwent, Calver 1983! (SFD).

Verrucaria aethiobola Wahlenb. **07**: Errwood Hall Estate, Goyt Valley 1980 *Fox*.

V. melaenella* Vainio **17: long undisturbed leadspoil, Tideslow Rake, Tideswell Moor 1977! Fourth British record of this inconspicuous species.

Vezdaea aestivalis* (Ohl.) Tsch.-Woess & Poelt **16: lead spoil heaps, Magpie Mine, Sheldon 1977! **17**: White Rake, Wardlow 1977 (SFD). **27**: lead spoil heaps, Harry Becca Mine, Hassop Common 1979!

V. retigera* Poelt & Döbb. **17: abundant on disturbed lead spoil, Tideslow Rake, Tideswell Moor 1977!

V. rheocarpa* Poelt & Döbb. **18: ledge in small limestone quarry, Earl Rake, Bradwell 1977!

Vorarlbergia renitens* Grum. sp. nov. **08: sandstone boulder in a stream, Low Leighton, New Mills 1978 *Fox*. First British record of what is probably a very overlooked species (Herb Fox, E. BM, SFD). Det B. J. Coppins.

Xanthoria polycarpa (Hoffm.) Rieber **18**: not uncommon on dust impregnated bark in the Bradwell area 1976!

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I am grateful to Professor B. W. Fox and O. W. Purvis for their company in the field and for providing many of the records. Dr D. L. Hawksworth, kindly made a file of notes accumulated up to 1976 available to me. Dr B. J. Coppins and P. W. James are thanked for determining many critical collections.

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BOOK REVIEWS

Green Planet edited by **David M. Moore.** Pp. 288, fully illustrated. Cambridge University Press. 1982. £12.50.

An excellent introductory volume to most aspects of plant life, with a balanced mix of popular and specialized material (mainly from an ecological standpoint) attractively presented. The approach is essentially encyclopaedic with well chosen coloured photographs, maps and diagrams to accompany a readable and informative text provided by a panel of leading British botanists. Inevitably some aspects receive more limited coverage (e.g. acid rain) and there are omissions (e.g. Richard Spruce). In general, the lower plants receive much less thorough coverage than the higher plants. The bibliography is surprisingly inadequate; cross-references to sources are not provided in the text, and on at least one occasion an illustration in not acknowledged(!): the figure on p. 255 is quite obviously based on that researched by myself for David Richardson's *The Vanishing Lichens*. Numerous spelling mistakes have been noted, particularly of Latin names, and there are several factual errors (e.g. 10 km^2 and 4 mi^2 on p. 39 should be 100 km^2 and 40 mi^2 respectively). Despite these criticisms, this book provides a sound foundation, well packaged, and reasonably priced.

MRDS

Perennial Garden Plants or **The Modern Florilegium.** A concise account of herbaceous plants, including bulbs, for general gardening. Revised and enlarged edition, written and illustrated by **Graham Stuart Thomas.** Pp. xvi + 388, 40 photographic plates (16 colour, 24 b/w). Dent. 1983. £14.95.

The title says it all! Few authors can have wider personal experience of the plants described in this far-ranging work: nine-tenths of them he has himself grown or known, and his expertise is apparent throughout this really invaluable book. First published in 1976 and immediately hailed as a classic, this new updated edition will be welcomed by plantsmen everywhere. Undoubtedly one of the best gardening books to be published this year, which no-one with an interest in plants and their cultivation can afford not to buy, even at this price.

VAH

The History of the Rose by **Allen Paterson.** Pp. 253, with numerous illustrations in colour and b/w throughout text. Collins. 1983. £15.

A most attractive and lavishly produced book, with an interesting and often unusual choice of illustrations. The author's researches have unearthed a great deal of fascinating information, and the complex history of the development of the rose as a cultivated plant from earliest times to the present day is presented in an interesting and very readable form.

At this price, perhaps a book to borrow from the library rather than to purchase, except for the really devoted rosarian.

Climbing Roses Old and New by **Graham Stuart Thomas.** Pp. 203, plus 8 colour and 16 b/w pages of plates. Dent. 1983. £10.95.

According to the blurb inside the jacket, the author 'has now completely revised and updated his classic account of growing climbing and rambling roses'. However, this reviewer could detect very little change from the revised edition of 1978: a few older roses have been dropped, and a short addendum of new ones added at the end, but the text remains the same, the bibliography shows no signs of any updating since the first edition (1965), and the illustrations remain unchanged, except that the colour plates are slightly less brightly tinted, and the very poor black and white photographs are even poorer in this printing. Surely these at least could have been replaced with more up-to-date examples, preferably in colour.

However, illustrations apart, the book is indeed a classic of its kind, full of invaluable information on varieties old and new(ish), and well worth acquiring if you do not already have an earlier edition – but if you have, do not bother with this one, in which little has altered except the price.

VAH

Wild Flowers by **Francis Rose.** Pp. 192, with 160 colour plates. Warne 1983. £1.95.

The issue of another reprint of the revised 1978 edition of the Wild Flowers volume in the Observers series, testifies to the popularity of this book. About 200 species are illustrated with accompanying descriptions and with habitat and distribution details. The illustrations are realistic representations of the species portrayed, though the colours are often somewhat pallid.

Alpine and Rock Plants by **Will Ingwersen,** and illustrated by **Charles Stitt.** Pp. vii + 212, with 8 photographic plates in colour and b/w line drawings in text. Dent. 1983. £10.95.

The name of Will Ingwersen is well known to everyone who has ever had any dealings with alpine plants, whether in the wild or in cultivation, and is in itself a guarantee of accurate and clearly presented information. This is a fascinating but highly personal account of alpines, and although packed with factual matter, is not a work to be quickly consulted, being specifically intended to be read; as he states in his preface, the author particularly wished to avoid the catalogue styles of many gardening books, and has tried to offer 'lovers of alpine plants what really amounts to a lifetime spent in seeking and growing alpine plants from all parts of the world' in 'a style that is both readable and informative'. This aim has been admirably achieved, and as an account of one man's involvement with alpines and their idiosyncrasies it is unparalleled. Fortunately, there is a good index, but be warned: having consulted the text on a specific point, you will not be able to avoid the temptation to read on further! A book by an enthusiast for enthusiasts.

VAH

Gardening on Walls by **Christopher Grey-Wilson** and **Victoria Matthews,** with paintings by **Victoria Goaman** and drawings by the authors. Pp. 320, with 24 colour plates and b/w drawings in text. Collins. 1983. £9.95.

An excellent book, covering over 1500 different species and cultivars, including many which are little known. All can be grown in the British Isles, although some would only be suitable for exceptionally favourable sites. The first part deals with the practical aspects of cultivation, i.e. soils and planting, supports, pruning and training, propagation, shrubs and climbers for different aspects and pests, diseases and disorders. The second part covers the plants themselves, an asterisk indicating those which the authors consider to be especially good. The colour plates, showing plants in close-up, cover a commendably wide range of species but are rather unpleasing as regards colour and general lay-out, but this may well be the fault of the printer rather than the artist.

Well worth buying for the admirable text, although the book is not, as the blurb would have us believe, the first book to deal specifically with the subject (cf. Roy Genders: **Covering a Wall,** Garden Book Club, 1974, and the little handbook on the subject by the R.H.S.).

VAH

FORAGING POPULATION SIZE AND DISTRIBUTION OF *BOMBUS MONTICOLA* IN THE PEAK DISTRICT, ENGLAND

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INTRODUCTION

The Bilberry bee, *Bombus monticola* Smith 1849 is one of Britain's moorland specialities but until recently, little was known about this beautiful animal. Indeed, until 1979, the British specimens had been misidentified as *B. lapponicus* Fabricius 1793 (Svensson 1979).

Between 1978 and 1980 a detailed study on the pollen collected by *B. monticola* was made (Yalden 1981, 1982) and coincidentally with the pollen study, distribution records and data on foraging population size were collected. The following paper reports on these aspects.

PART 1. RELATIVE FORAGING POPULATION SIZE OF *B. monticola* and white tailed bumblebees

Materials and methods

The relative sizes of the foraging population of *B. monticola* and white tailed bumblebees were assessed at the study areas described in detail by Yalden 1981. Briefly, these are four moorland locations; *Calluna vulgaris* is the dominant plant, there are large areas of *Vaccinium myrtillus* and *V. vitis-idaea,* some *Erica cinerea* and/or *E. tetralix.* Other plants growing close to the study areas include *Ulex europaeus, Salix* sp., *T. rifolium repens, Lotus corniculatus, Rubus fruticosus, Chamaenerion angustifolium* and *Rhododendron ponticum.* (Plant nomenculture follows Clapham, Tutin & Warburg (1959).)

Most of the data were collected during 1978-1980.

In 1978, the Roaches study area (Grid Ref. SK 0062) was visited most weekends from 13 April to 23 September. Anything from 4 to 22 counts of the foraging population were made during one visit. In 1979, 8 visits were made between 12 April and 17 June but *B. monticola* numbers were so few that alternative study sites were sought and only one other visit, on 19 August, was made that year. In 1980, the site was visited thrice in May and once in June.

In 1979, study areas at Swineholes Wood (SK 0450), Agden (SK 2593) and Blacka Moor (SK 2880) (see Part 2) were discovered and were visited once a week from mid June to 2 September in that year, and again in 1980, from 24 April to 24 August. On average 4 counts were taken per visit per site.

The sizes of the foraging populations of *B. monticola* and white tailed bumblebees were counted in 15-minute periods while slowly walking past an area of flowering plants. Within a single 15-minute count, the same clump of flowers was not revisited, so minimizing the possibility of counting a single bumblebee twice. Depending on the type of food plants available, it was not always possible to be surveying flowering plants for the whole 15 minutes, some of this time was taken walking from one clump of flowers to the next. When flowers were very dispersed, counts of less than 15 minutes were taken and a new count commenced, once more flowers were encountered.

The mean number of bees seen per 15 minutes was calculated for each week. To smooth out irregularities in these means, a 3-point running mean (i.e. mean of weeks 1+2+3, then 2+3+4, etc.) is presented; because counts were so irregular, standard deviations are invalid, so the range is given.

RESULTS

The mean weekly counts are given in Table 1, and 3-point running means are shown in Fig 1. Though these counts are referred to as the population size, once the queens have produced workers, they in fact reflect the foraging population. The individual counts were very irregular (due particularly to vagaries of weather and the different flowers under surveillance), so the running means (Fig 1) are the most valuable.

B. monticola queens emerged from hibernation from mid April. The earliest date that workers were observed during the 3-year study was 10 May (1980) but appreciable numbers of workers were not foraging until the last week of May (Fig 1). The population increased in size to reach a peak during the second half of June. The number of *B. monticola* foraging dropped

dramatically during July, then recovered in August but not quite to the size of the June population. The foraging population declined during late August, eventually tailing off in September.

The earliest observed male was 22 June 1980 but new queens were not seen until the second week of August. However, caste was not always observed and these records might be atypical.

In the field, it is impossible to distinguish between *B. lucorum* (Linnaeus, 1761) and *B. terrestris* (Linnaeus, 1758) males and workers, but it is probable that most of the white tailed bumblebees were *B. lucorum* (Yalden 1983). They will, conservatively, be referred to as white tailed bumblebees in this paper.

The white tailed queens started to emerge from hibernation at the same time as the *B. monticola* queens but by May the white tailed queens far outnumbered the *B. monticola* queens (Fig 1). From the last week in May until the first week in July, the number of foraging white tails was very low but from the second week in July the population increased in size, reaching a maximum in mid August when they were foraging on *C. vulgaris* (Yalden 1983). The white tailed bumblebee population started to decline during the last week in August which was a little later than for *B. monticola* (Fig 1) but a few individuals of both groups of bees have been seen foraging as late as the last week in September.

Discussion

On average *B. monticola* queens emerge during the last week in April. They must settle down to nest building very soon after emergence, as considerable numbers of workers are foraging by the end of May (Fig 1): development from egg to adult takes approximately 5 weeks (Alford 1975). The white tailed bumblebees are very different, for though an occasional worker is seen in May, large numbers are not foraging until the second week of July. These early white tailed workers may in fact be from colonies situated at lower altitudes which are further advanced than those in the study areas.

From the end of May until the end of June, the number of foraging *B. monticola* increases; this peak is coincidental with the lowest number of foraging white tails (Fig 1). However, the trough in white tailed foragers is not far below the peak of *B. monticola* foragers and it is obvious that, considered over the whole season, white tailed bumblebees far outnumber *B. monticola* (approximately 2:1, Table 1).

In mid July the *B. monticola* foraging population crashes. As this crash occurred in each year of the study and was not mirrored by the white tailed bumblebees, it could not have been caused by unseasonal weather conditions. Neither was it caused by an inability to find workers after the moorland flowers had failed and the bees were dispersed, as the highest number of *B. monticola* were recorded in late June, when the workers had already left the moors and started foraging on waysides (Fig 1).

The crash comes after *V. myrtillus, V. vitis-idaea, U. europaeus* and *L. corniculatus* have finished flowering and when *T. repens* and *E. cinerea* are the favoured flowers (Yalden 1981, 1982). It may be that workers find it difficult to collect sufficient pollen and nectar at this time; *E. cinerea* is not abundant in the Peak District and, except for the occasional hay crop, *T. repens* is not abundant either. Therefore the larvae may suffer shortage of food and die of starvation, or have an extended developmental period, thus diminishing recruitment to the foraging population. Indeed, the shortage of food may start in mid June, for the moors which provide an abundance of food when *V. myrtillus* and *V. vitis-idaea* are in flower provide very little food once *V. vitis-idaea* has finished flowering. The bumblebees then have to forage on wayside flowers until late July. Though *B. monticola* will collect pollen from a wide variety of plants (Yalden 1981), it forages mainly on *L. corniculatus* immediately the *Vaccinium* flowers are over (Yalden 1981, 1982). *L. corniculatus* is fairly common on waysides close to the study areas but it cannot be considered to provide an abundance of flowers comparable to *Vaccinium*.

The food shortage should not have an immediate effect on the size of the foraging population for grubs which have pupated by this time would be unaffected and will develop into adults in the normal way and time. This may explain the high foraging population in mid/late June when food has already become scarce (Fig 1). When food becomes plentiful again in late July/early August, the foraging population also increases in size.

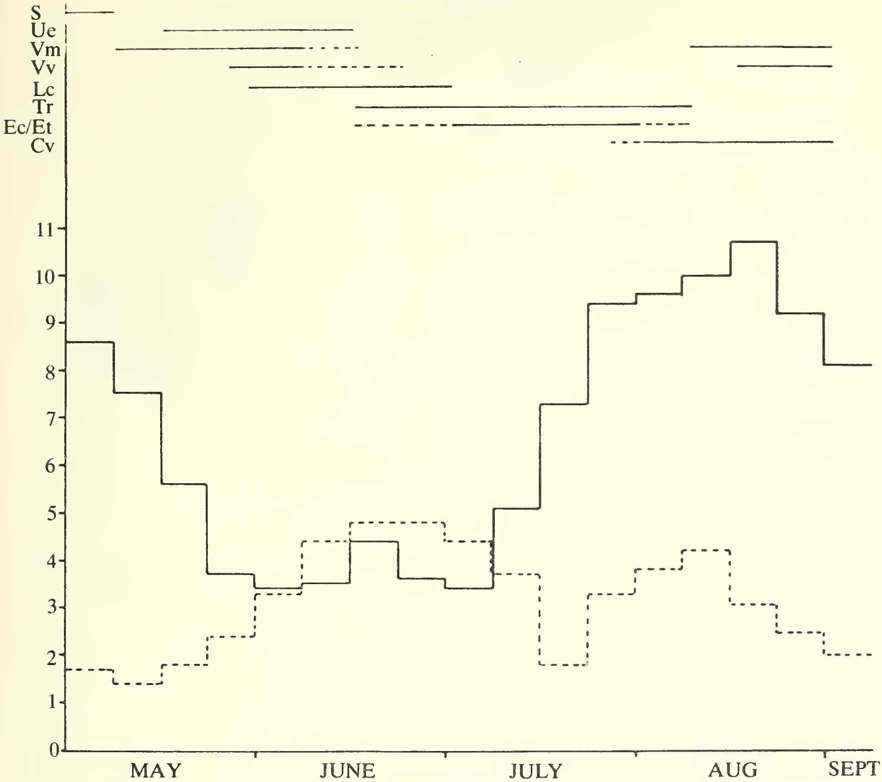

FIGURE 1

Number of foraging bumblebees/15 minutes.

Histograms represent a 3 point running mean of number of bumblebees counted/15 minutes throughout the foraging season, (dotted line – *B. monticola,* solid line – White tailed bumblebees). The bars at the top indicate the flowering seasons of the plants most commonly visited by bumblebees (solid line – peak flowering, dotted line – less profuse flowering), S = *Salix,* Ue = *Ulex europaeus,* Vm = *Vaccinium myrtillus,* Vv = *V. vitis-idaea,* Lc = *Lotus corniculatus,* Tr = *Trifolium repens,* Ec/Et = *Erica cinerea/E.tetralix,* Cv = *Calluna vulgaris.*

An alternative explanation for the crash in the numbers of foragers is that *B. monticola* has two generations in one season and the 'low' occurs when new queens are setting up colonies which will produce workers, males and queens before September. Alfken (1914), Meidell (1968) and Løken (1977) all felt that there was evidence of a second generation in *B. jonellus* (Kirby) and that other members of the subgenus *Pyrobombus* (which includes *B. monticola*) may also show this characteristic during favourable summers. Svenson (1979) found no evidence to support this theory but he was working much further north than the other three workers, in an area where flowering period is compressed compared with areas further south. It is unlikely that bumblebees would be able to fit two generations into one season at the northerly limits of their distribution though Douglas (1973) had evidence that this occurred during an abnormally dry and mild summer in Troms county, arctic Norway, a location even further north than Svensson's

TABLE 1
Number of foraging bumblebees counted/15 minutes

Date	*B. monticola* per 15 mins	range	White tailed bumblebees per 15 mins	range	No. of 15 min. counts
Apr 22-30	1.9	0.0- 8.5	6.2	3.5- 9.3	25.0
May 1-7	2.1	0.5- 3.5	10.6	1.5-21.5	16.0
May 8-14	1.7	0.0- 5.5	12.3	0.5-30.0	26.7
May 15-21	1.4	0.0- 6.0	5.8	0.3-26.0	36.0
May 22-31	2.8	0.0-10.0	4.5	0.5-33.0	51.0
June 1-7	3.2	0.0-10.3	2.9	0.0-15.0	28.7
June 8-14	4.8	2.0- 7.5	4.7	2.0- 8.0	10.0
June 15-21	4.4	0.0-12.0	4.8	0.0-20.0	42.3
June 22-30	10.7	1.0-25.0	11.5	2.0-19.0	2.7
July 1-7	5.7	0.0-20.5	6.8	0.4-24.0	38.7
July 8-14	2.0	0.0- 5.8	3.7	1.0- 6.0	21.3
July 15-21	1.9	0.0-11.0	13.0	0.0-45.0	16.0
July 22-31	1.0	0.0- 5.0	6.7	0.0-18.0	20.0
Aug 1-7	5.7	0.1-15.0	9.6	1.0-18.4	30.7
Aug 8-14	4.6	0.0-23.0	14.6	0.8-36.0	20.7
Aug 15-21	3.4	0.0-18.0	11.7	0.0-60.0	27.5
Aug 22-31	3.8	0.0-21.0	16.1	1.0-96.0	30.0
Sept 1-7	2.3	0.0- 6.0	6.4	0.0-19.0	20.3
Sept 8-14	0.6	0.0- 2.0	2.4	0.0- 6.0	12.3

study area. The Peak District populations of *B. monticola* are at the southern end of the distribution and are therefore the most likely to have a second generation if this does occur. Unfortunately, in the present study, little attention was paid to caste and the results can neither substantiate nor refute the second generation theory.

When the *B. monticola* foraging population is low, the white tailed foragers are increasing in numbers and carry on increasing until mid/late August with no check (Fig 1). Therefore, the white tailed bumblebees are presumably getting sufficient pollen and nectar to feed both the adult and the developing larvae. White tailed bumblebees do have a slightly wider pollen preference than *B. monticola* and the percentage similarity in the pollen types collected by the two groups of bees is lowest in June and July (Yalden 1981, 1983).

Part 2. Distribution

Materials and methods

Records of distribution of *B. monticola* in the Peak District were first collected in 1973 as a contribution to the bumblebee distribution maps scheme. Further records were collected in later years (1974-1982) but on a 1 km^2 basis. The Peak District National Park covers approximately 1,400 km^2 and to check each 1 km^2 for presence or absence of *B. monticola* would be a formidable task. Authors agreed that the presence of *B. monticola* was linked with *Vaccinium* moorland (Newman 1834, Smith 1844, Sladen 1912, Laidlaw 1930, Step 1932, and Alford 1975) and this was born out by the preliminary bumblebee atlas (Alford 1973); the search for *B. monticola* therefore, was confined to *Vaccinium* moorland and its immediate environs. As more information on pollen preference of *B. monticola* became available, it was easier to predict the type of habitat where *B. monticola* would be found. By 1980 it was known that *B. monticola* collected pollen mainly from *V. myrtillus, V. vitis-idaea, U. europaeus, L. corniculatus, T. repens, T. pratense, E. cinerea,* and *C. vulgaris* (Yalden 1981, 1982). This range of plants can only be found growing in close proximity on the edges of *Vaccinium* moorland, and therefore the search for *B. monticola* was concentrated in this type of habitat during 1981 and 1982.

FIGURE 2
Distribution of *B. monticola* in the Peak District.
The solid line represents the Peak District National Park Boundary. ● = abundant sites, ◐ = semi-abundant sites, ○ = scarce sites, △ = records supplied by Mr. T. Riley and Mrs. E. Thorpe. The graticule indicates 10 km² of the National Grid.

Results

The distribution of *B. monticola* in the Peak District is given in Fig 2. Negative records have not been indicated for though they show the area covered by the recorder, they are not very accurate on a 1 km^2 scale when plotting the distribution of a flying insect.

B. monticola was found in most 10 km^2 encompassed by the Peak District National Park boundary. The exceptions were SK 07 and SE 01, which are moorland habitats and SK 16, SK 15, SK 14 and SK 25 which are limestone. The absence of *B. monticola* in the limestone areas is unremarkable, the plants in such areas are not those favoured by *B. monticola*. However, the absence of *B. monticola* from the moorland areas is less understandable.

The records have been divided into three groups:

1) Abundant: 4 sites.

These are four areas where *B. monticola* constitute at least half the total bumblebee population during late May/early June and where at least a few *B. monticola* were seen on every visit during the summer (when weather conditions were fit for bumblebees to fly). These areas became the main study sites for estimating bumblebee population size and pollen preferences (Yalden 1981, 1982). They are Roaches (SK 0062), Swineholes Wood (SK 0450), Blacka Moor (SK 2880) and Agden (SK 2593). The name Agden for Grid Ref. SK 2593 is an artificial one as the 1 inch Ordnance Survey gives no specific name for this area.

2) Semi-abundant: 5 sites.

These include 3 areas where *B. monticola* constitute at least half the total bumblebee population for a short period of the season but have too limited a flora for bumblebees to forage there at other times. *B. monticola* are found on *V. myrtillus* during May and late August at Ewden Height, (SK 2397), on *E. cinerea* during late July/early August at Snake Pass (SK 0593) and on *T. repens* and *C. vulgaris* during August at Smallfield, (SK 2494). The Smallfield populations are most likely to be workers from colonies at Agden, 1 km away.

Chunal Moor (SK 0392) and Ringinglow (SK 2783) were areas with abundant *B. monticola* when first discovered in 1973 and 1979 respectively, but following the introduction of sheep and the loss of flowering *V. myrtillus,* high June populations of *B. monticola* have not been observed since. Therefore, these sites have been classified as semi-abundant.

3) Scarce: 56 sites.

These are areas where *B. monticola* have been recorded but were generally only visited once. *B. monticola* may in fact be more abundant than suggested in some of these areas as some sites were visited in mid/late July, the period when the *B. monticola* population is at its lowest (Fig 1). However, none of these sites appeared to have 'good *B. monticola* habitat' *(Vaccinium* moorland close to *U. europaeus, L. corniculatus, T. repens, Erica* spp., and *C. vulgaris),* or if this mixture of plants was present, there was so little of some species that it would only provide forage for a small number of bumblebees.

Broadhurst Edge Wood (SJ 9987, a Derbyshire Naturalists' Trust Reserve) was visited 3 times, 19 and 28 May and 12 June 1979 and fifteen, 15 minute counts were made. However, the *B. monticola* numbers were consistently low (average 0.13 *B. monticola*/15 mins, range 0.0-0.3), though white tailed bumblebees were plentiful (average 10.6 white tails/15 mins, range 2.0-21.0). Broadhurst Edge Wood was therefore classified as a scarce site.

The total of 56 scarce sites includes 8 site records of *B. monticola* supplied by other observers.

Discussion

A distribution map can never be complete; changes in land use can have a dramatic and immediate effect on bumblebee populations. This was demonstrated at 3 sites, Roaches (SK 0062), Chunal Moor (SK 0392) and Ringinglow (SK 2883), where previously ungrazed moors were used for sheep. The loss of the flowering shoots of *V. myrtillus* and *C. vulgaris* caused a sharp drop in the numbers of *B. monticola.* Unfortunately, no counts were made at Chunal Moor or Ringinglow and the drop in bumblebee numbers is a subjective assessment. However, there was more information for Roaches, where high numbers of *B. monticola* had been observed in July and August 1977 (Table 2). Sheep were put on the moor in January 1978 and were removed in January 1980. In May and June 1978, when the sheep had been on the moor for

TABLE 2

Number of foraging bumblebees at Roaches

Date	*B. monticola* per 15 mins	*B. monticola* range	White tailed bumblebees per 15 mins	White tailed bumblebees range	No. of 15 min. counts
23.vii .77	8.2	*	12.2	*	6.0
13.viii.77	4.3	4.0- 4.5	14.9	4.0-22.7	12.0
20.viii.77	11.5	7.5-16.2	29.7	23.0-37.8	3.7
May 1978	1.3	0.4- 3.6	6.8	2.8-13.0	65.7
May 1979	0.8	0.0- 1.5	4.2	0.4- 8.0	16.7
May 1980	1.6	0.0- 6.0	2.0	0.5- 5.0	8.0
June 1978	4.2	1.5- 7.3	2.1	0.8- 4.7	21.6
June 1979	0.6	0.0- 1.0	1.4	0.0- 3.0	26.3
June 1980	3.1	1.0- 1.5	1.5	1.0- 2.0	8.0

*Bumblebees were counted continuously for 90 minutes.
(Comparing June 1979 with June 1978, Mann-Whitney U-test, U=30, p 0.01).

4-5 months, the numbers of foraging *B. monticola* were only slightly lower than good sites elsewhere (Fig 1). By the following year, the numbers were significantly lower (Table 2), indeed they were so low that the area was abandoned as a study site. Unfortunately, it was difficult to make similar statistical comparisons with the May figures as the number of counts were too discrepant (Table 2).

During May 1979, the number of *V. myrtillus* flowers in 6 x 0.1m^2 were counted in 3 different parts of the study area which was grazed and on the roadside which was fenced and therefore protected from sheep (except for the occasional stray). The *V. myrtillus* on the ungrazed roadside produced 5.5 times more flowers than the *V. myrtillus* in the study area (Table 3). Unfortunately, the roadside only supported a few *V. myrtillus* bushes and the overall loss of flowers in the area adversely affected the number of *B. monticola* (Table 2).

However, there is some indication that the habitat might be recovering since the removal of sheep, as the few 1980 counts suggest an increase in the number of foraging *B. monticola*.

Despite the reservations about any distribution map, Fig 2 provides a fairly accurate picture of where *B. monticola* can be found in the Peak District. Though *B. monticola* is widespread on the moorland, it cannot be considered to be an abundant species, except in 4 areas. Even there its maximum population size is far lower than that of white tailed bumblebees (Fig 1).

TABLE 3

Number of *Vaccinium myrtillus* flowers in 0.1 m^2 on grazed and ungrazed areas at Roaches, 26 May 1979

	Number of *V. myrtillus* flowers in 0.1 m^2 area 1	area 2	area 3		
	117	40	25		276
	95	28	19		203
Grazed	75	19	29	Ungrazed	294
	88	21	68	(roadside)	371
	115	15	22		250
	74	11	94		345
Average = 53.1 ± 37.1				Average = 289.8 ± 61.5	

Unfortunately, for many years the number of sheep being grazed on the moors has been increasing (Yalden 1972), this has considerably reduced both the extent and quality of moorland plants (Anderson & Yalden 1981) and is probably the principal reason for *B. monticola* not being found in SK 07 and SE 01. It is to be hoped that the remaining moorland areas will be protected from sheep overgrazing and the deliberate conversion of moorland into grassland. Unfortunately, examples of recent habitat destruction can be found in the Peak District, e.g. Gun Hill (SJ 9661) and Oxhays (SJ 9660), and the continued presence of *B. monticola* in the Peak District may in fact be under threat.

Conclusions

The findings of this combined study show that mid/late June and the second week in August are the best times for searching for *B. monticola* and that mid July is unprofitable.

In agreement with other authors *B. monticola* was only recorded on or close to *Vaccinium* moorland. In the Peak District it was found in 16 out of 18 10 km^2 of moorland habitat and was recorded in a total of 65 1 km^2.

For most of the summer the foraging population of *B. monticola* is far lower than that of white tailed bumblebees but there is a brief period in early June when this is reversed. The profiles of the foraging population of the two groups of bees are totally different; considering the species as a whole *B. monticola* sets up colonies much faster than white tailed bumblebees but whether *B. monticola* completes its life cycle more rapidly cannot be determined from the information presented in this paper.

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I should like to thank the Staffordshire Naturalists' Trust, the Peak Park Planning Board and Sheffield Recreation Department for access to their land, Professor D. M. Guthrie for providing laboratory facilities in the Zoology Department, Manchester University, Mrs E. M. Thorpe and Mr T. Riley (Sheffield Museum) for distribution records and Dr D. W. Yalden for his generous assistance and advice.

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FIELD NOTE

A Yorkshire record of the Chinese Mitten Crab

Southfield Reservoirs, which lie NNW of Thorne in Yorkshire, are two adjacent compensation reservoirs connected to the busy Aire and Calder Navigation Canal. They occupy 43 ha. and extend to a depth of 1.5 m.

In 1949 a young angler, to his surprise, caught a crab in the smaller, eastern reservoir. This was eventually taken to Castleford Grammar School. The animal was 'fenced off' in a stream near Hollywell Wood, Glasshoughton, for further examination, but disappeared after a few days and was not relocated. The details were brought to the attention of Merseyside naturalist Eric Hardy, who identified the crab as a Chinese Mitten Crab *Eriocheir sinensis* Milne-Edwards. Hardy *(in litt.)* notes that the crab, as described to him, had a carapace of about 10 cms. width, and was a mottled green-brown; it had a 'velvet covering' on the chelae (the 'mittens'), and the dactyli of the walking legs were white. It is the presence of the 'mittens' on the chelae, together with the fact that no other crab would be expected in this situation, which make the record acceptable (Dr Geoffrey Fryer *in litt.).*

Although Hardy has published the record in some popular magazines (e.g. *Aquarist, Fishing News),* the details have, understandably, not been widely noted. For example, Gledhill *et al.* (1976) write: 'In [1935] a single specimen was taken in the Thames but no more specimens have been reported.' A few other British records are now known, but Dr Fryer comments that the 1949 example, which was previously unknown to him, remains the only Yorkshire instance of this alien species being reported. It is a native of China, and is now well established in several European rivers, possibly having travelled from the east in the ballast tanks of ships.

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YORKSHIRE NATURALISTS' UNION EXCURSIONS IN 1982*

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CONONLEY and LOTHERSDALE (VC 63), 3 July (C. Shields)
Cononley village lies on the right bank of the River Aire between Keighley and Skipton. The broad, flat-bottomed valley showed evidence of recent flooding. Ox-bow lakes were formerly a feature of this stretch, but nearly all have now been infilled and the waterside fields drained to form meadows and hayfields.

The River Aire is joined by the Cononley Beck, which has its source in the area of lead mines to the south-west of the village. It cuts down steeply through shales to form a steep-sided, V-shaped valley. Peat Gill and Pismire Gill form side valleys. There is much woodland near the streams. Many of the steep fields adjoining these water courses are unimproved and contained the more interesting of the day's finds. The limestone quarry, Hawshaw Slack Delph, was visited by one member.

There was a good attendance of over thirty people, including some members of the local Crosshills Naturalists' Society. The tea and meeting were held at the Cononley Institute. The President, Mr J. Mather, took the chair. Reports were presented and the vote of thanks was given by Mr M. Sykes, mentioning particularly the landowners who had granted access to their properties.

Ornithology (J. R. Mather)
Thirty-seven species were recorded in the area of the low-lying meadows. All three species of wagtails were present along the river, and the three hirundines were well represented, with large numbers of House Martins feeding in the lee of the trees. A solitary male Redstart was recorded and Whitethroat and Willow Warbler, with Sedge Warbler in song along the riverbanks, were the only three warbler species encountered, which was to be expected in this habitat. Curlews were in the meadows and obviously breeding. Three gulls, Black-headed, a solitary Common and a few Lesser Black-backs, were passing over and had no direct attachment to the area. A Heron was flushed, and a single Kestrel was hunting over the fields.

Mammals (J. R. Mather)
A single Rabbit and a dead Common Shrew were the only species noted.

Amphibia (D. T. Richardson)
Common Frog (*Rana temporaria*), Common Toad (*Bufo bufo*) and Smooth Newt (*Triturus vulgaris*) were in the Dead Eye Canal and on its margins. In the lead mine pond there were very large numbers of young Common Frogs and several adult males and females as well as young Smooth Newts.

Lepidoptera (Mrs J. Payne)
During the morning it was heartening to see large colonies of Small Tortoiseshell, *Aglais urticae*, larvae at various stages on nettles on the riverside ings and pasture, and a few newly emerged adults were flying. A small colony of the Common Blue, *Polyommatus icarus*, was in the dell near the Weasel Green fishing pond. The Small White, *Pieris rapae*, and Small Heath, *Coenonympha pamphilus*, were noted as singles.

A few Chimney Sweepers, *Odezia atrata*, were flying on the same site as the Common Blue. The Snout, *Hypena proboscidalis*, the Twin-spot Carpet, *Colostygia didymata*, and the Silver-ground Carpet, *Xanthorhoe montanata*, were all beaten on the lane sides. Here Sloe and Bird Cherry were badly afflicted by *Yponomeuta* spp, which were pupating in the webs on the

* continued from p.118.

bushes. Evidence of the Foxglove Pug, *Eupithecia pulchellata*, was found. The Light Barred, *Campaea margaritata*, and the Large Yellow Underwing, *Triphaena pronuba*, were seen. On the banks of the mill stream running by the recreation ground, larvae of the Lychnis, *Hadena bicruris*, were inhabiting the seed capsules of Red Campion.

Coleoptera (M. L. Denton)

During the period preceding the meeting, heavy rain had caused flooding, especially in the meadows adjoining the River Aire. This was probably the cause of the relative lack of species in this area. However, *Phyllobius urticae* and *P. parvulus* were in good numbers, and the local *P. viridicollis* were found. Four common Cantharids and six species of Chrysomelid were present. At Dead Eye, a single specimen of *Donacia semicuprea* was obtained, this species being associated with *Glyceria maxima*. The only true water beetle from this habitat was the common *Agabus guttatus*.

In the afternoon, the pond near the lead mine was examined, but yielded only singles of *Haliplus ruficollis* and *Agabus paludosus*. At the pond edge, ground beetles *Agonum marginatum* and *Patrobus excavatus* were taken. The gills produced water beetles of the species *Agabus bipustulatus*, *A. biguttatus*, *Ilybius fuliginosus*, *I. ater* and *I. fenestratus*. Dung produced only *Aphodius fimetarius*, a fine species with a bright red elytra.

Other Arthropods (D. T. Richardson)

Collecting was confined to the Cononley Ings riverside meadows, Dead Eye and the lead mine pond and tip heaps at Weasel Green. As was expected, the non-calcareous nature of the area limited the number of species found. These were:

Woodlice: *Oniscus asellus*, *Porcellio scaber*, *Trichoniscus pusillus* agg.

Centipedes: *Lithobius crassipes*, *L. forficatus*.

Millipedes: *Polydesmus angustus*, *Tachypodoiulus niger*.

Harvestmen: these were more abundant, particularly in the riverside meadows. Species recorded were: *Mitopus morio*, *Nemastoma bimaculatum*, *Phalangium opilio*, *Leiobunum rotundum*, *Platybunus* (= *Rilaena*) *triangularis*. The last three were new 10 km square records.

Leeches: the presence of large numbers of *Haemopis sanguisuga* (Horse Leech) under stones on the margins of both the lead mine pond and Dead Eye was particularly interesting as well as being new 10 km square records.

Freshwater triclads: *Polycelis tenuis* in the lead mine pond, and *P. tenuis*, *P. nigra* and *Planaria torva* in the Dead Eye Canal, all new 10 km square records. *P. tenuis* and *P. nigra* are quite common and well distributed throughout the British Isles, but *P. torva*, on the other hand, is far less common and has a discontinuous national distribution which is not fully understood.

I should like to thank Dr and Mrs L. Lloyd-Evans for their help during the day.

Flowering Plants and Ferns (D. R. Grant)

In the morning the party worked from Mill Bridge to the ox-bow called Dead Eye. The most outstanding plant to be found here was *Hordeum secalinum*, a grass of Southern and Eastern Britain which reaches its northern limit in Yorkshire. Here too were *Barbarea vulgaris*, *Festuca arundinacea*, *Scrophularia umbrosa*, *Rorippa sylvestris* and *Salix viminalis*. In the River Aire were the Pondweeds *Potamogeton natans*, *P. perfoliatus* and *P. pectinatus*, together with *Polygonum amphibium* and *Scirpus lacustris*. In the vicinity of Dead Eye were *Glyceria maxima*, *Thalictrum flavum* and *Salix pentandra*. The roadside verges on the return journey to the village yielded *Polypodium vulgare*, *Prunus padus* and *Rosa villosa*.

In the afternoon, the Cononley Beck and its side gills were explored. In the main gill, *Primula vulgaris*, *Fragaria vesca*, *Ophioglossum vulgatum* and *Carex caryophyllea* were all interesting finds for the Millstone Grit. A side gill had a large colony of *Dactylorhiza fuchsii*, together with *Listera ovata* and *Orchis mascula*. There was also a large stand of *Equisetum telmateia*. The sedges here were *Carex panicea*, *C. flacca*, *C. caryophyllea*, *C. hostiana* and *C. pulicaris*.

The old lead mine area near Weasel Green was found to be virtually barren due to recent disturbance. None of the rare plants which can tolerate these conditions was found. The nearby

pond was almost covered with the Pondweed *Potamogeton natans*, together with the Duckweeds *Lemna minor* and *L. trisculca*, whilst *Equisetum fluviatile* was growing on the southern shoreline.

On the limestone at Hawshaw Slack Delph in Lothersdale, *Triglochin palustris* and *Gentianella amarella* were reported.

Bryology (T. L. Blockeel)
The 10 km square 34/94 has been well recorded in recent years, and it was not expected that many additions would be made. The banks of the Aire near Cononley are not rich in bryophytes, having few large trees or rocks to provide the necessary habitats. *Leskea polycarpa*, *Orthotrichum diaphanum* and *Tortula latifolia* were found on willows. The gills on the hillside above Cononley were similarly not sufficiently deep or rocky for the rarer Millstone Grit species. The best place was at the head of Swires Plantation, where the stream has cut a small rocky gully. Species here included *Heterocladium heteropterum*, *Isothecium myosuroides*, *Plagiochila porelloides,* and, growing on *Thamnobryum alopecurum*, *Lejeunea cavifolia*. A poorly grown *Metzgeria* from the rock face here seemed best referred to *M. conjugata*. *Thuidium tamariscinum* was frequent on grassy banks, and *Plagiochila asplenioides* sens. str. (*Plagiochila asplenioides* var. *major*) was in the gill below the lead-mine. Both these species are rare in S.W. Yorkshire. *Amblystegium varium* was also by the stream below the lead-mine. Waste areas at the mine itself produced none of the well-known 'plubicolous' mosses: the most plentiful species here were *Dicranella varia* and *Jungermannia gracillima* (*Solenostoma crenulatum*). *Drepanocladus aduncus* was in some wet ground nearby. A visit to the old limestone quarry at Hawshaw Slack Delph near Lothersdale produced *Leiocolea badensis* on soil and in rock crevices, *Ptilidium ciliare* among grass, and *Seligeria recurvata, Orthotrichum cupulatum*, *Drepanocladus uncinatus* and *Brachythecium glareosum* on rock.

BEDALE and THORP PERROW (VC 65), 17 and 18 July (F. B. Stubbs)
Enjoying fine weather, some fifty members attended, with eighteen societies and all YNU Sections represented. On the Saturday morning, Mr John Beach led a tour of Thorp Perrow Arboretum. These sixty acres contain many rare trees, introduced earlier in this century. The adjoining lake and abandoned parts of a gravel pit were seen later. Sunday morning was spent around Bedale Park and Bedale Beck, and the afternoon in the vicinity of Langthorn Wood and adjoining arable land.

After a very acceptable tea at Plummers Restaurant, the President, Mr John Mather, chaired the meeting for reports, when several contributors mentioned new VC 65 records. Mr I. Lawrence expressed the thanks of the members to those who had helped to make the weekend a success, in particular to Sir John and Lady Ropner for the facilities offered at Thorp Perrow, and to Mr Beach.

Ornithology (G. E. Alderson)
The weather was hot, and the total count of species was 27 at Thorp Perrow and 23 at Bedale. The Thorp Perrow Arboretum was rather limited in variety of species. The only raptor was a Sparrow Hawk, seen as it shot across an open area. Although several Woodpecker borings were seen, the bird was neither seen nor heard. A Carrion Crow protested, perhaps having young in the trees. Birds seen included Long-tailed, Blue and Coal Tits, Blackbird, Thrush, Robin and Wren. Heard among the heavy leaf cover were Nuthatch, Marsh Tit, Goldcrest and Black-cap.

The lake in front of the house had young Coot with adults, Mallard, Great Crested Grebe, a female Tufted Duck and a pair of Mute Swans. The adjoining gravel quarry had a pair of Oystercatchers and a Moorhen nest with three eggs. Black-headed and Lesser Black-backed Gulls flew over. Pheasant, Magpie, Jackdaw and Wood Pigeon were also seen.

Many of the same species were seen also in the Bedale area, and the total included several additions. A Spotted Flycatcher nest contained five dead young, and a Kingfisher flew along the Beck. Collared Dove, Stock Dove, House Martin, Swallow, Swift, Starling, Yellow Bunting, Chaffinch, Goldfinch, Greenfinch and Willow Warbler completed the list.

Entomology (W. A. Ely)
The Arboretum at Thorp Perrow had numbers of common hoverflies and bees feeding on the flowers in the rides, and the areas of long grass produced many grassland insects. Among the less common ones were the acalypterate fly *Opomyza petrei*, whose larvae feed in grass stems, and the predatory midges *Palpomyia distincta, P. nemorivaga* and *Stilobezzia gracilis*. Mr Norris found a female woodwasp, *Uroceras gigas*, struggling in the lake; this insect is equipped with a strong ovipositor and lays its eggs into pine logs. A small dried-up pond nearby had plenty of ground beetles under the vegetation, including *Bembidion dentellum* and *B. obliquum*. Across the road, the gravel pit near Park House had few insects except for the large number of Common Blue Damselflies. Water insects were very sparse except in the few patches of vegetation, where *Haliplus confinis* and *H. obliquus* were among the water beetles.

The weevil *Polydrusus pterygomalis*, an iridescent green beetle with rather swollen temples, was found at Bedale Hall on the Sunday, and in the afternoon Langthorn Wood produced the non-biting midge *Microtendipes pedellus* and the acalypterate *Saltella sphondylii* whose larvae feed on dung. The sawflies here were the large green *Rhogogaster punctulata*, whose larvae are polyphagous tree leaf feeders, the black *Macrophya ribis*, whose larvae feed on Elder, and *Priophorus ulmi*, an Elm feeder.

Among the interesting beetles found by Mr M. L. Denton was *Atomaria fuscicollis*.

Lepidoptera (Mrs J. Payne)
During the weekend ten species of butterfly were seen. The Ringlet, *Aphantopus hyperantus*, was in all three localities in small numbers, as also was the Meadow Brown, *Maniola jurtina*, the three Whites and the Small Tortoiseshell, *Aglais urticae*. The Red Admiral, *Vanessa atalanta*, was seen at Thorp Perrow and was ovipositing on nettles just outside Bedale. The Small Skipper, *Thymelicus sylvestris*, was at Thorp Perrow and this may be the most westerly Yorkshire site. The Large Skipper, *Ochlodes venata*, was seen at Langthorn Wood. The most exciting find was the White-letter Hairstreak, *Strymonidia w-album*, seen at both Thorp Perrow and Langthorn Wood. This again is the most westerly Yorkshire record to date.

Twenty-two species of moth were seen. Cinnabar, *Callimorpha jacobaeae*, larvae were still feeding on Ragwort at Thorp Perrow, and the Sandy Carpet, *Plemyria flavofasciata*, was flying near its food plant, the Red Campion. The Small Fanfoot, *Zanolognatha nemoralis*, was also flying. Large numbers of the Twin-spot Carpet, *Colostygia didymata*, were set up in the rides of the Arboretum. The Small Fanfooted Wave, *Sterrha biseleta*, was present, along with several more common moths.

Coleoptera (M. Denton)
Forty-one species were recorded. These included representatives of the *Brachelytra*, *Rhynchophora*, *Lamellicornia*, *Heteromera*, *Geodephaga*, *Phytophaga*, *Longicornia*, *Malacodermata*, *Sternoxia* and *Clavicornia*. Notable species were *Donacia simplex*, *Scaphosoma boleti* and *Atomaria fuscicollis*.

Arachnology (C. J. Smith)
At this time of the year, when relatively few species can be found in their mature stage, it is pleasing to report that 33 species of spider were recorded. Very little work had been done previously in SE 28, and as a result 24 species were added to the total for this 10 km square. The following call for special comment:

Anelosimus vittatus, a first record for VC 65, near to its northern limit in Britain.

Araneus cucurbitinus, the first record in VC 65 since 1920.

Cyclosa conica, another first record for VC 65. Two immature specimens were taken, but the conical 'abdomen' is so characteristic that identification was reliable.

Lepthyphantes tenebricola, although on the increase in the north of England, this species is far from common.

A thorough search for the continental invader *Pityohyphantes phrygianus* failed to have any success, though the species is now firmly established in spruce and other conifers in North Yorkshire.

Flowering Plants and Ferns (Mrs D. M. Bramley)
Whilst the major item of interest for the botanists at Thorp Perrow was the splendid arboretum of unusual and exotic trees, the wild flora of the grounds provided a considerable list of species. At the side of the path through the trees a show of *Cicerbita macrophylla* was pleasing to see, and later several plants of *Campanula latifolia*. On a bare ride *Taraxacum laevigatum* and *Chaenorhinum minus* were noted. In wet areas, *Alisma plantago-aquatica*, *Hippuris vulgaris*, *Veronica beccabunga* and *V. anagallis-aquatica* were found.

After lunch, members investigated the gravel workings on the opposite side of the road. Here a different flora presented itself, including *Origanum vulgare*, *Erigeron acer*, *Clinopodium vulgare*, *Linum catharticum* and *Briza media*, all calcicoles. On one bank *Gentianella amarella* was in abundance, but not yet in flower; nearby a good display of *Ophioglossum vulgatum* was found. In the water of a shallow pool a small amount of *Eleocharis uniglumis* was discovered, probably the best find of the day.

On Sunday, in Bedale Park beside the golf course, *Carex spicata* was the most interesting discovery, and a lovely display of *Campanula latifolia* the most spectacular. In the afternoon the typical cultivated and woodland flora included no startling finds, but by the adjoining railway side *Blackstonia perfoliata*, *Gymnadenia conopsea* and *Dactylorhiza fuschsii* were of interest.

The two days produced a total of 201 species, of which 40 were additions to the 10 km square SE 28, as given in the *Atlas of the British Flora*.

This report incorporates lists and notes from D. R. Grant and W. J. Stone.

Plant Galls (F. B. Stubbs)
Of the 50 examples seen, most were in rather small numbers. The fungus gall of *Albugo candida* on *Capsella bursa-pastoris* is rather local; the leaf gall of the mite *Eriophyes tristriatus typicus* was found on Walnut, itself an uncommon tree in the district. A case of phyllanthy was noted, the inflorescence of *Trifolium repens* carrying a mass of small leaves. The abnormality has recently been ascribed to a mycoplasma which, perhaps to over-simplify, lies between virus and bacterium. This example is very erratic in its appearance, but widespread in some years.

Mycology (A. Hawkswell)
Observations of fungi were mainly at Thorp Perrow, where 26 species were noted as follows:

Scutellinia scutellata
Daldinia concentrica
Xylaria polymorpha
Ustilago violacea (*on Silene dioica*)
Amanita rubescens
Lepiota rhacodes
Armillaria mellea
Tricholomopsis rutilans
Russula mairei
Russula nigricans
Marasmius androsaceus
Lactarius turpis
Clitocybe infundibuliformis
Laccaria laccata
Inocybe fastigiata
Agaricus campestris
Hypholoma fasciculare
Panaeolus semi-ovatus
Coprinus micaceus
Boletus erythropus
Boletus luridus
Boletus elegans
Auricularia auricula-judae
Dacrymyces deliquescens
Lycoperdon pyriforme
Oudemansiella radicata

Bryology (T. L. Blockeel)
The Arboretum did not provide habitats for many bryophytes, much of the ground being grassed over. There were some small areas of bare moist soil, on which were found *Ditrichum cylindricum*, *Dicranella schreberana*, *Physcomitrium pyriforme* and *Physcomitrella patens*. Epiphytes included very small amounts of *Frullania dilata* and *Ulota phyllantha*, the latter on Willow. Epiphytes in general were conspicuous on the older native trees, and it was noteworthy that the planted trees of the Arboretum, though admittedly young, were almost devoid of bryophytes. The gravel pit, explored by Miss J. Robertson, had some interesting ephemerals colonizing bare ground, with *Pottia starkeana* ssp. *conica*, *Physcomitrella patens*, *Leptobryum*

pyriforme and *Bryum gemmiferum*. Especially notable were *Ditrichum pusillum*, not recorded in Yorkshire for many years, and *Riccia cavernosa**, which (as distinct from *D. crystallina*) is new to VC 65. A distinctive *Bryum* with bulbils was also found, which appears to be distinct from the known members of the *B. bicolor* group; it is still under investigation.

A visit was also made to the Ure banks near Masham, where *Myrinia pulvinata** was found, new to the vice-county, among *Leskea polycarpa* on a tree bole. Of equal interest was the discovery nearby of a second Yorkshire site for *Tortula virescens* on the base of an Ash tree, the previous record (from Teesdale) being the first for the British Isles. *Barbula trifaria* and *Tortula latifolia* were also found on the river banks.

CURIMOPSIS NIGRITA (PALM) [COLEOPTERA : BYRRHIDAE] FROM THORNE MOORS, SOUTH YORKSHIRE

P. C. BUCKLAND and C. JOHNSON

During April 1977, Colin Johnson of the Manchester Museum obtained a single specimen of a Byrrhid new to the British fauna whilst sieving litter on Thorne Moors (SE 71), South Yorkshire. Subsequent investigation (Johnson, 1978) identified the species as *Curimopsis (Syncalypta* of auctt.) *nigrita* (Palm), a beetle which has a limited distribution elsewhere, on either side of the southern Baltic and in southern Bavaria (Paulus, 1979). This discovery prompted a re-examination of the fossil identified as *Syncalypta striatopunctata* Steff. in an assemblage from deposits of ca. 3,000 years ago, towards the base of the peat on Thorne Moors (Buckland, 1979). The initial identification had been made in 1972 by comparison with specimens in the Gorham Collection in the University of Birmingham and had been checked against the Doncaster Museum collection. However, as Johnson (1978) notes, the possibility of confusion was high and the fossil was therefore sent to him for checking. The fossil consists of a single complete left elytron, retaining a few of its outstanding marginal setae. Identification as *C. maritima* (Marsh.) (≡ *S. striatopunctata* Steff.) could be dismissed but there remained the possibility of confusion between *C. setiger* (Ill.) and *C. nigrita* (Palm). On balance, the specimen most closely approaches the latter species on the form of the setae but the identification must remain tentative at *C. ? nigrita.*

Retrospectively, it is interesting to compare the reconstruction of the Thorne Moors palaeoenvironment nearly 3,000 years ago (Buckland, 1979, 59-60) with Johnson's (1978, 145) account of his recent capture of *C. nigrita*. First Buckland writes

> 'The transition towards more acid conditions is also evident in Sample 4. Although the dead stump of the oak still projected above the surface of the bog, its environment had changed considerably. All the feeders upon the living trees disappear and there are no indicators of birch or willow scrub. The phytophages are restricted to dead wood species and a few feeders upon lower plants . . . None of these is suggestive of raised bog but the heather beetle *Lochmaea suturalis*, usually occurs on ling, *Calluna vulgaris* . . . Several changes occur within the Carabid fauna which also indicate an opening up of the habitat. Both *Bradycellus ruficollis* and *B. harpalinus* often occur on the ground beneath *Calluna* . . . Similarly the deciduous woodland and fen species *Trichocellus placidus* gives way to the dry heath *T. cognatus,* which is also recorded from raised bogs in southern Sweden. A change also occurs in the predatory Lygaeid bugs, from the shade favouring *Drymus brunneus* to the more xerophilous *D. sylvaticus*.'

Johnson's (1978) account is rather more succinct:

> 'Whilst sieving vegetational debris in a boggy situation with heather and peat on Thorne Waste.'

The similarity between the two accounts, the one recent, the other palaeoenvironmental, adds support to the identification of the fossil as *Curimopsis nigrita.* It further emphasises a point

made in the report upon the palaeoecology of Thorne Moors (Buckland, 1979): the survival of rare and endangered species relies as much, if not more, upon habitat continuity as upon availability. Johnson (1978) describes *C. nigrita* as 'clearly a relict species at Thorne'. The fossil faunas from the Bronze Age trackway horizon at the base of the Moors provide a salutary comment upon such 'relict species'. Over 25% of species identified now have a very restricted distribution in Britain and six species, including one of the most common fossils, *Prostomis mandibularis,* have become extinct in the British Isles. It must be significant that virtually all the beetles whose distribution has been curtailed belong to woodland habitats and they include *Rhysodes sulcatus,* the species for which K. Dorn (in Horion, 1935) coined the term *Urwaldrelikt,* those animals of primary undisturbed woodland, something which man has virtually eradicated from Europe (Westoff, 1971). The survivors maintain a tenuous existence in those fragments of woodland with a long history of conservation, the parks and hunting preserves of royalty and the nobility, in Sherwood, Windsor, Fontainebleau and Versailles, for example, where modern forestry practice now presents a threat to their survival. Man's effect on the beetle fauna, however, is not restricted to forest species. Fenland water beetles have shown a similar retraction in their distribution with the drainage of lowland wetlands (Buckland, 1979, 85-86, 116). It is probable that *C. nigrita,* apparently with a preference for the rapidly disappearing habitat of lowland raised bog, survives at Thorne because, despite the Moors' much misused present form, it remains the country's largest surviving area of lowland bog (Rogers & Bellamy, 1978), with a continuity of habitat stretching back nearly 3,000 years.

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BOOK REVIEWS

Monotremes and Marsupials: the Other Mammals by **T. J. Dawson.** Pp. vi + 90. Arnold. 1983. £3.30 paperback.

This book contains within the limits of a small volume many results of recent research on marsupials and monotremes. (It is worth noting that 50 of the 54 references in the bibliography are 1970 or later). The emphasis is on evolution, diversity and particularly function. The last includes reproduction, energy and temperature relationships, cardiovascular and respiratory functions and brain and intelligence. This is an excellent account particularly for comparison with placental functions.

MJD

Field Guide to British Deer edited by **F. J. Taylor Page.** Pp. 95, with 30 figures. Blackwell. 1982. 3rd Edition. £3.95.

The third edition of this book provides much useful information on field techniques used in the study of deer. This is supplemented by a considerable amount of data on deer biology and distribution. An extremely valuable account for the field naturalist with a wealth of information packed into a small and inexpensive volume.

MJD

THE IDENTITY OF WILLIAM SUTCLIFFE OF HEPTONSTALL

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In a recent paper I described the bryophyte collection of William Sutcliffe of Heptonstall, which is now housed at Bankfield Museum, Halifax (Blockeel, 1980). At the time of writing only circumstantial evidence was available regarding Sutcliffe's life and work, but now through the vigilance of Mr F. Murgatroyd two letters have come to light from the archives of the Hebden Bridge Literary and Scientific Society which supply many of the missing details. The letters were written in 1923 to two Hebden Bridge naturalists by Sutcliffe's daughter Emily, the first to Samuel Fielding on 24 April and the second to Edward Gibson on 14 May. The letter to Samuel Fielding followed a visit by him to Miss Sutcliffe at Stone Slack, Heptonstall: he had apparently enquired about some photographs of the Todmorden naturalists John Nowell and Abraham Stansfield. The letter begins:

> Since you were here last week I found the photographs of John Nowell & Abram Stansfield of Todmorden. As probably only yourself would remember my father, I thought perhaps some of the other members who were with you here would be interested also in seeing his.

The photographs of Nowell and Stansfield, together with two of William Sutcliffe, have been preserved along with the two letters. Miss Sutcliffe also refers to two paragraphs about her father's collection which had appeared in the 'District News', stating that it 'really formed part of the collection which was in the hands of the Todmorden Literary & Scientific Society'. She writes:

> Of course it may have done but I have never heard anything to that effect. I only know that my father was proud of his collection of *mosses* saying that he had been several times told that he had the best collection in the district. His collection of ferns was not as varied.

The surviving material certainly has the appearance of being one man's collection, though it may of course have been passed subsequently to the Todmorden Society.

The second letter was written in response to a request for information about the botanist's life.

> Dear Mr Gibson,
>
> Thanks for your letter enclosing a resolution passed by the Committee of the Literary & Scientific Society and I can only say how pleased I am that the collection of plants is so much appreciated. Yes, you may copy the photographs of my father if you wish to and also the ones of John Nowell and Abr^{m} Stansfield if necessary.
>
> I don't know that I can give you many particulars about my father's life that would be of interest to naturalists. I can however give the date and place of his birth &c and perhaps you may be able to glean a few items and please discard the rest.
>
> William Mitchell Sutcliffe was born at Field Head in Stansfield on Jan 11th 1816 and was one of four children but the only son of Tho^{s} Sutcliffe whose wife Mary was a daughter of John Mitchell of Hill Top in Stansfield.
>
> Tho^{s} Sutcliffe was born at Great House in Colden which house the family had owned & occupied since the beginning of the seventeenth century when it was purchased from a Thomas Greenwood by John Sutcliffe 1621.
>
> From Field Head my grandfather Tho^{s} Sutcliffe removed to Heptonstall after having given up the business of manufacturing at Edge Mill which he had begun in 1808.
>
> In Heptonstall my father received his education at the local grammar school.
>
> In 1834 he was apprenticed for five years as a doctor with a relative W G Mitchell, Surgeon, of Cross Hills near Keighley. Here he lived, until the death of this cousin, before the apprenticeship was completed, brought my father back into Heptonstall to take up life in the grocery business my grandfather had established.

> It was after his return to Heptonstall I take it, that he began his collection of plants, and possibly the study of biology in connection with medicine first turned his mind towards botany. His familiarity with greek and latin would make the classification easier to him than to a man of lesser education.
>
> In 1860 he married Rachel Lister a daughter of George Lister, Timber Merchant of Hebble End, Hebden Bridge.

The remainder of the letter, giving particulars of a pocket account book kept by Miss Sutcliffe's grandfather, is not relevant to William Sutcliffe. In my earlier paper I suggested that Sutcliffe lived all his life at Heptonstall and was a pupil at the local school. This is now shown to be correct, with the exception of the short time spent at Cross Hills. However, the assumption that he was a teacher at Heptonstall School is now seen to be mistaken, and there is no evidence that his daughter had any connection with the school. The utilization of pages from school exercise books as bryophyte herbarium packets would appear to be coincidental.

I am grateful to Mr F. Murgatroyd for drawing my attention to Miss Sutcliffe's letters and also for providing much additional information. He has also pointed out that the untraced locality 'Earlees' referred to in the earlier paper is in fact at Colden, Heptonstall (grid square 34/92).

Reference

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BOOK REVIEWS

Epping Forest Through the Ages by **Georgina Green**. Pp. 56, with 15 photographs and 2 prints in monochrome and 2 maps. Published by the author from 39 Smeaton Road, Woodford Bridge, Essex. 1982. £1.75.

Epping Forest lies with its southernmost part embedded in the suburbs of east London and runs northwards in a narrow crescent, bending gently to the east for a distance of about 18 km. At no point is it more than 3 km wide, and in most places it is considerably narrower. It occupies a gravelly ridge of poor soils between the River Lea and the River Roding, and is of interest as a surviving example of the effects of medieval woodland management. We are fortunate to have a land use history for the past thousand years (Rackham, *Essex Naturalist*, 1978) and a pollen profile from 4000 years before the present (Baker, Moxey and Oxford, *Field Studies*, 1978). This booklet combines conclusions from these sources with archaeological and historical information from the Mesolithic period onwards into a well illustrated and very readable and interesting narrative. The climax of the story is the events leading to the vesting of responsibility for the forest with the Corporation of London and its dedication to the public by Queen Victoria in 1882.

FHB

Heather Angel's Countryside, written and photographed by **Heather Angel.** Pp. 160, fully illustrated in colour. Michael Joseph/Rainbird, in association with Channel 4 and Yorkshire TV. 1983. £7.95 paperback.

Colourful and informative book to accompany the Yorkshire Television series 'Making the Most of . . .', with habitat studies based on visits made to suitably representative sites throughout Britain, including several of Yorkshire interest: Ingleborough, the Derwent, Flamborough Head, Fairburn Ings, Seamer, Potteric Carr, Ilkley Moor, Leeds and Liverpool Canal, Strid Woods, etc. The quality of Heather Angel's photography is up to her usual high standards.

The Origins of Garden Plants by **John Fisher.** Pp. xviii + 338 (including line drawings & b/w photographs), plus 5 colour plates. Constable. 1982. £12.95.

Attractively illustrated account of the history of garden plants, which deals as much with the collectors themselves as with the plants they introduced. Unfortunately there are numerous errors in both text and captions; some are factual, but many could have been rectified by more rigorous proof-reading.

BOTANICAL REPORT FOR 1982

Flowering plants and ferns

The thanks of the Flowering Plant Section go to Mr. J. R. Hickson for his work as Recorder for V.C. 64. Mr. L. Magee succeeds him in 1983.

All the Recorders wish to thank members who have contributed to these reports. Names are given the first time they appear in each vice-county report and thereafter initials are used.

The figures indicate 10 km grid squares. † new county record; * new vice-county record.

East Yorkshire (VC 61) (F. E. Crackles)

The most notable records relate to old discoveries, certain identification being impossible at the time. In the case of an orchid population, found in the River Hull valley in 1963, R. H. Roberts has examined a set of colour transparencies and is quite certain that the plants belong to that taxon which he described in *Watsonia* in 1961 as a new subspecies of *Dactylorhiza majalis,* naming it *D. majalis* ssp. *cambrensis.* Two colonies of this subspecies were then known, one in Anglesey and one in Cardiganshire, whilst three further populations have since been found in Wales. The East Riding record for this taxon is the only other British record.

Asplenium adiantum – nigrum L. West Heslerton railway station 44/97; F. E. Crackles.

Polystichum setiferum (Forsk.) Woynar Rise Park 54/14; YNU Excn., det. F.E.C.; a second vice-county record.

Ranunculus sardous Crantz Near Harlthorpe 44/73 ; J. E. Duncan & F.E.C. In calcareous arable field, Driffield 54/05; E. Chicken.

†*Ranunculus penicillatus* (Dumort.) Bab. var. *vertumnus* C.D.K. Cook Foston Beck 54/05; C. Newbold.

Lepidium campestre (L.) R. Br. By Foston Beck, Little Kelk 54/05; F.E.C.

Coronopus didymus (L.) Sm. By Humber Dock, Hull 54/02; F.E.C.

Saponaria officinalis L. Rudston village 54/06 ; F.E.C.

Stellaria nemorum L. Moreby Park 44/64; J. Payne & D. R. Grant.

Medicago sativa L. Sherburn and West Heslerton road-sides 44/97; cultivated at West Heslerton; F.E.C.

**Trifolium micranthum* Viv. Rise Park 54/14; F.E.C.

**Epilobium montanum* x *roseum* = *E.* x *mutabile* Boiss. & Reut. Escrick Park; YNU Bot. Sect. Excn. 44/64, det. F.E.C.

Myrrhis odorata (L.) Scop. Hedge by remains of garden, S. Cliffe; E.Ch.

Smyrnium olusatrum L. Between S. and N. Cliffe 44/83; J. Spencer & E.Ch.

Salix pentandra L. West of Sancton 44/83; D. Grant; Thornton 44/74; E.Ch.

Myosotis discolor Pers. Rise Park 54/14; L. Lloyd-Evans.

Linaria repens x *vulgaris* = *L.* x *sepium* Allman Priory Yard sidings 54/02, a second vice – county record, both being for 54/02; F.E.C.

**Stachys palustris* x *sylvatica* = *S.* x *ambigua* Sm. Cornfield edge, Tollingham 44/83; F.E.C.

Plantago coronopus L. Ganton roadside 44/97; F.E.C.

Allium vineale L. Near Breighton 44/73; J.E.D.

†*Dactylorhiza majalis* (Reichb.) Hunt & Summerh. ssp. *cambrensis* R. H. Roberts Marsh by River Hull, near Driffield 54/05, 1963; F.E.C., det. from photographs by R. H. Roberts (1981); a first record for England.

Carex pseudocyperus L. Escrick Park 44/64; E.Ch.

†*Carex acuta* x *C. acutiformis* = *C.* x *subgracilis* Druce by River Hull, near Hallytreeholme 54/04, 1955; F.E.C., conf. A. C. Jermy & O. A. Chater, 1982.

Festuca pratensis x *Lolium perenne* = *Festulolium loliaceum* (Huds.) P. Fourn. Water-meadow, Withernwick 54/14; F.E.C.

Agrostis canina L. ssp. *canina* Water-meadow, Withernwick 54/14; F.E.C.

North-East Yorkshire (V.C. 62) (T. F. Medd)

Ranunculus lingua L. Middlesbrough 45/41; I. Lawrence.

Myosoton aquaticum (L.) Moench Marton 45/51; I.L.

Euonymus europaeus L. Cayton 05/08; R. Gulliver.

Populus nigra L. s.s. (female) Stonegrave 44/67; R.G.
Trientalis europaea L. Hovingham 44/67; York & District F.N.S.
Anagallis foemina Mill. Garden weed, York 44/65; Mrs Ashworth-Bartels.
Taraxacum aurosulum H.Lindb.f. near Hackness 44/99; E. Chicken.
T. euryphyllum (Dahlst.) M.P.Chr. do. 44/99; E.C.
T. hamatum Raunk. do. 44/99; E.C.
T. lacistophyllum (Dahlst.) Raunk. do. 44/99; E.C.
T. nordstedtii Dahlst. do. 44/99; E.C.
T. porrectidens Dahlst. do. 44/99; E.C.
T. raunkiaerii Winst. do. 44/99; E.C.
Butomus umbellatus L. Marton 45/51; I.L.
Gagea lutea (L.) Ker-Gawl. Ayton 45/51; I.L.
Gymnadenia conopsea (L.) R.Br. Pilmoor 44/47; T.F.M.
Dactylorhiza fuchsii (Druce) Soó x *traunsteineri* (Sauter) Soó near Pickering 44/88; D. J. Tennant and B. & A.Wright.
D. incarnata (L.) Soó x *traunsteineri* (Sauter) Soó with above 44/88; D.J.T. and B. & A.W., conf. R. H. Roberts. Second English record.
Glyceria x *pedicellata* Townsend York 44/55; Y. & D.F.N.S.
Koeleria cristata (L.) Pers. Scarborough 54/08; R.G.

South-West Yorkshire (V.S. 63) (D.R. Grant)
Equisetum sylvaticum L. Cononley 34/94; YNU Excn.
E. telmateia Ehrh. Cowling 34/94; D. R. Grant.
Ophioglossum vulgatum L. Holmfirth 44/10; J. Stone.
Ranunculus auricomus L. Cowling 34/94; T. Schofield.
Thalictrum flavum L. Cononley 34/94; YNU Excn.
Saponaria officinalis L. Bradley, Huddersfield 44/11; E. Thompson.
Tilia x *europaea* L. Stocksmoor, Huddersfield 44/11; Dr. L. Lloyd Evans.
Chenopodium bonus-henricus L. Shepherd Hill, Ossett 44/22; D.R.G.
Geranium sylvaticum L. Carleton, nr. Skipton 34/94; D.R.G.; Holmfirth 44/10; J.S.
Ulex gallii Planch. Jackson Bridge, Huddersfield 44/10; T.S.
Fragaria vesca L. Thurgoland 44/20; D.R.G.
Prunus domestica L. Lofthouse 44/32; D.R.G.; South Hiendley 44/41; T.S.
Angelica archangelica L. Lee Moor, Wakefield 44/32; D.R.G.
Rumex alpinus L. Harropdale, Diggle 44/00; Mrs. B. Bescomby.
Populus tremula L. Bradley, Huddersfield 44/11; E.T.
Salix pentandra L. Cononley 34/94; YNU Excn.; Bradley, Huddersfield 44/11; E.T.
Erica cinerea L. Jackson Bridge, Huddersfield 44/10; T.S.
Pyrola rotundifolia L. Woolley Moor, Wakefield 44/31; C. Hartley.
Hottonia palustris L. Methley Lanes, Wakefield 44/32; C. S. V. Yeates.
Gentianella amarella (L.) Börner Hawshaw, nr. Cononley 34/94; T. Blockeel.
Atropa bella-donna L. Stapleton, Pontefract 44/51; C.H.
Scrophularia umbrosa Dumort. R. Aire, Cononley 34/94; YNU Excn.
Strachys palustris L. Stanley, Wakefield 44/32; D.R.G.
Campanula latifolia L. Glusburn 34/94; T.S.
Galium verum L. Thorpe, nr. Wakefield 44/32; E. W. Littleton.
Adoxa moschatellina L. Bretton Park, Wakefield 44/21; M. T. Brook.
Cirsium heterophyllum (L.) Hill Dobcross 34/90; B.B.
Crepis paludosa (L.) Moench Cononley 34/94; YNU Excn.
Potamogeton epihydrus Raf. Canal, Mirfield 44/12; B.&J.L.
Dactylorhiza fuchsii (Druce) Vermeul. Kilner Bank, Huddersfield 44/11; B.&J.L.; Cononley 34/94; YNU Excn.
D. praetermissa (Druce) Vermeul. Nr. Cadeby Common 43/59; YNU Bot. Excn.; Oulton 44/32; C.S.V.Y.; Stourton, nr. Leeds 44/32; C.S.V.Y.
Carex laevigata Sm. Long Causeway, Sheffield 44/28; E.T.

C. demissa Hornem. Kilner Bank, Huddersfield 44/11; B.&J.L.
C. pallescens L. Sun Wood, Shelf 44/12; D.R.G.
C. caryophyllea Latourr. Cononley 34/94; YNU Excn.
C. spicata Huds. Mirfield 44/22; E.T.
Glyceria maxima (Hartm.) Holmberg Nr. Cullingworth 44/03; D.R.G.
Hordeum secalinum Schreb. Cononley 34/94; YNU Excn.

Mid-West Yorkshire (V.C. 64) (J. R. Hickson)
Papaver lecoqii Lamotte Disturbed ground, Knotford, Otley 44/24; roadside, Garforth 44/43; C. S. V. Yeates.
Diplotaxis tenuifolia (L.) DC Allerton Bywater 44/42; A. Pearson.
Coronopus squamatus (Forsk.) Aschers In lane near Ox Close, East Keswick 44/34; near South Stainley Church 44/36; C.S.V.Y.
C. didymus (L.) Sm. Grounds of Grantley Hall 44/26; J. E. Duncan.
Cardaria draba (L.) Desv. Kippax 44/43; D. R. Grant & T. Schofield.
Atriplex littoralis L. By the A1 road, Wetherby 44/44; C.S.V.Y., conf. W. A. Sledge.
Rosa afzeliana auct x *R. sherardii* Davies Along a bridleway at Wike, Harewood 44/34; C.S.V.Y., det. R. Melville.
Saxifraga granulata L. Thornthwaite 44/15; D.R.G. & T.S.
Populus nigra L. var. *betulifolia* W. bank of R. Wharfe at Tadcaster 44/44; R. Gulliver, conf. E. Milne-Readhead.
Salix repens L. S.E. corner of Swinsty Reservoir 44/15; L. Magee.
Mimulus moschatus Dougl. ex Lindl. Near Swetton, Kirby Malzeard 44/27; D.R.G. & T.S.
Sambucus ebulus L. Hazelwood Castle 44/43; D.R.G. & T.S.
Inula helenium L. Easedyke, Walton 44/44; C. Hartley.
Picris echioides L. On rough ground near Cross Green Industrial Estate, Leeds, 9 44/33; C.S.V.Y.
Juncus compressus Jacq. Roadside near Whinmoor Leeds 44/33; in a marshy meadow, Barwick-in-Elmet; C.S.V.Y.
Dactylorhiza incarnata (L.) Soó ssp *pulchella* (Druce) Soó Cow Mires, Galphay 44/27; D. J. Tennant.
D.praetermissa (Druce) Soó Two sites at Knostrop, Leeds 44/33; Leventhorpe Ash Ponds, Swillington 44/32 and /33; C.S.V.Y.
Carex vesicaria L. Allerton Mauleverer 44/45; Y.N.U. Excn.
C. divulsa Stokes ssp *leersii* (Kneucker) Walo Koch Grimbald Crags, Knaresborough 44/35; D.J.T., 1980, det. R. W. David.
Puccinellia distans (L.) Parl. Ledston 44/42; C. Braham.
Hordeum secalinum Schreb. Grass verge at Barwick-in-Elmet 44/33; C.S.V.Y.
Hordelymus europaeus (L.) Harz Holden Clough, Silsden 44/04; T. L. Blockeel.

North-West Yorkshire (V.C. 65) (T. F. Medd)
Lycopodium clavatum L. Dent 34/69; A. J. Stoddart.
Botrychium lunaria (L.) Sw. Wensleydale 44/18; Yoredale N.H.S.
Ophioglossum vulgatum L. Thorp Perrow 44/28; Y.N.U. Excursion.
Trollius europaeus L. Wensleydale 44/18; Y.N.H.S.
Helleborus viridis L. do. 44/18; Y.N.H.S.
Ranunculus hederaceus L. Dent 34/68 and 34/78; A.J.S.
R. omiophyllus Ten. Dent 34/68; A.J.S.
Rorippa sylvestris (L.) Bess. Wensleydale 44/18; Y.N.H.S.
R. islandica (Oeder) Borbás do. 44/18; Y.N.H.S.
Minuartia verna (L.) Hiern Wensleydale 44/08; Y.N.H.S. (confirmation of a pre-1930 record).
Chenopodium rubrum L. Dent 34/68; A.J.S.
Parnassia palustris L. Wensleydale 34/98; Y.N.H.S.
Lythrum salicaria L. Dent 34/78; A.J.S.
Hippuris vulgaris L. Thorp Perrow 44/28; Y.N.U. Excn.

Cornus sanguinea L. Wensleydale 34/98 and 44/18; Y.N.H.S.
Polemonium caeruleum L. Preston-under-Scar 44/09; F. B. Stubbs.
Veronica anagallis-aquatica L. Thorp Perrow 44/28; Y.N.U. Excn.
Stachys arvensis (L.) L. Dent 34/68; A.J.S.
Eupatorium cannabinum L. Wensleydale 44/09; Y.N.H.S.
Centaurea scabiosa L. do. 44/09 and 44/18; Y.N.H.S.
Juncus subnodulosus Schrank Thorp Perrow 44/28; Y.N.U. Excn.
Epipactis helleborine (L.) Crantz Wensleydale 44/18; Y.N.H.S.
Plantanthera chlorantha (Custer) Reichb. Dent 34/68 and 34/78; A.J.S.
P. bifolia (L.) Rich. Dent 34/68; A.J.S.
Orchis ustulata L. Wensleydale 34/99; Y.N.H.S.
O. morio L. do. 44/18; Y.N.H.S.
Dactylorhiza maculata (L.) Soó Dent 34/69; A.J.S.
D. incarnata (L.) Soó Dent 34/68; A.J.S.; Wensleydale 34/88; Y.N.H.S.
Eleocharis uniglumis (Link) Schult. Thorp Perrow 44/28; Y.N.U. Excn.
Carex bigelowii Torr. ex Schwein Brant Fell 34/69; R. W. M. Corner.
C. divulsa ssp. leersii (Kneucker) Koch Nosterfield 44/28; D. J. Tennant.
C. spicata Huds. Bedale Park 44/28; Y.N.U. Excn.

Casuals and adventives (E. Chicken)

During the year eight people have sent a total of 92 records involving 55 taxa. Again fields treated with wool waste have afforded a long list, this time from Mr C. S. V. Yeates. One error has come to light in the previous report; *Poa chaixii* should be deleted. The list which follows has been selected from the total list.

The following initials have been used.
F.E.C. Miss F. E. Crackles
C.S.V.Y. Mr C. S. V. Yeates

Vice-county numbers are given in parentheses.

Azolla filiculoides Lam. Goosehill, Wakefield 44/32; G. Willmore.
Diplotaxis muralis (L.) DC. (63) Wyther Park, Leeds 44/33; C.S.V.Y.
Hirschfeldia incana (L.) Lagreze-Fossat (63) by ring-road at Farnley 44/23 and on tip near Morley 44/22; C.S.V.Y.
Bunias orientalis L. (64) edge of field at Micklefield 44/43; C.S.V.Y.
Chenopodium ficifolium Sm. (63) disused tip, Middleton 44/22; C.S.V.Y.
Chenopodium hybridum L. (64) waste ground, Leeds 44/22; C.S.V.Y. confirmed E. J. Clement.
Illecebrum verticillatum L. Railway sidings, Greetland 44/02; J. Watson.
Medicago falcata L. Battyeford, Mirfield 44/12; B. & J. Lucas.
Trifolium incarnatum L. (63) fields at Rothwell 44/32; C.S.V.Y.
Trifolium subterraneum L. (63) fields at Rothwell 44/32; C.S.V.Y.
Colutea arborescens L. (64) waste ground Leeds 44/23: C.S.V.Y.
Vicia lutea L. (63) by underpass at Rothwell Haigh 44/34; C.S.V.Y.
Lathyrus hirsutus L. (63) waste ground, Farnley, Leeds 44/23; C.S.V.Y.
Potentilla intermedia L. (64) gravel pits, Knostrop, Leeds 44/33; C.S.V.Y.
Heracleum mantegazzianum Somm. & Levier (63) Glusburn 34/94; D. R. Grant.
Anethum graveolens (63) Battyeford, Mirfield 44/12; B. & J. Lucas.
Polygonum sachalinense F. Schmidt (64) Kirkstall, Leeds 44/23: C.S.V.Y.
Cannabis sativa L. (61) Mytongate, Hull 54/02; F.E.C.
Amsinckia intermedia Fischer & Meyer (61) Rudston 54/06; F.E.C. and Millington 44/85; R. Jefferson via F.E.C.
Scrophularia vernalis L. (62) Coxwold 44/57; Mrs. M. Burnip via T. Medd.
Veronica longifolia L. (64) Moseley Wood, Cookridge 44/24; C.S.V.Y. 1981.
Rudbeckia laciniata L. (61) hedgerow, Allerthorpe Common 44/74; YNU det. E. Chicken.
Silybum marianum (L.) Gaertn. (63) Rothwell 44/32; C.S.V.Y.
Centaurea melitensis L. (63) Rothwell 44/32; C.S.V.Y.
Cicerbita macrophylla (Willd.) Wallr. (64) Low Bentham 34/66; D. R. Grant.

Crepis tectorum L. (62) car park near Roseberry Topping, Great Ayton 45/51; Mrs. M. Burnip via T. Medd.
Ornithogallum umbellatum L. (64) meadow near Boston Spa 44/44; C.S.V.Y.
Sisyrinchium montanum Greene var. *cerebrum* Fern. (61) Hull 54/12; F.E.C.
Bromus arvensis L. (64) Temple Newsam Park, Leeds 44/33; C.S.V.Y. det. P. J. O. Trist.
Agrostis scabra Willd. (61) Priory Yard sidings, Hull 54/02; F.E.C.

BOOK REVIEWS

Thorne Moors: A Palaeoecological Study of a Bronze Age Site by **P. C. Buckland.** Pp. vi + 173, including 24 figures and 4 tables. Occasional Publication No. 8, Department of Geography, University of Birmingham B15 2TT. 1979. £2.
An important contribution to our knowledge of Thorne Waste, a once extensive wetland on the Yorkshire/Lincolnshire boundary and now reduced through nineteenth-century drainage and warping to approximately 21 km^2 of degraded *Sphagnum* bog. Although this publication deals mainly with the history of its insect fauna, a considerable amount of environmental interpretation is provided which will be of interest to a wider readership.

The English Garden by **Laurence Fleming** and **Alan Gore.** Pp. 256 (including many b/w plates in text) plus numerous colour plates. Michael Joseph/Mermaid Books. 1980. £5.95 paperback.
This large-format paperback series, excellently produced and very reasonably priced, deserves every success; like other titles issued so far, this book offers an interesting and informative text – much of it from original sources – lavishly illustrated with well-chosen, and often unusual, examples. The history of English gardens through the centuries is followed by three most useful appendices, succinctly supplying information not easily come by elsewhere: 'A chronological list of gardens, gardeners and authors', 'Places improved by Bridgeman, Kent, Brown and Repton' and 'Origins of garden plants'. Well worth buying.

A Dictionary of Ecology, Evolution and Systematics by **R. J. Lincoln, G. A. Boxshall** and **P. F. Clark**. Pp. viii + 298. Cambridge University Press. 1982. £25.
An invaluable reference book for students, teachers and researchers, providing not only a working dictionary of essential explanations in line with current usage, but also thirty pages of useful appendices of tables and maps on such topics as biogeographical regions of the world, marine depth zones, SI units, signs and symbols, acronyms and abbreviations, Latin abbreviations, proof correction marks, and the Beaufort wind scale.

A Directory of Natural History and Related Societies in Britain and Ireland, compiled and edited by **Audrey Meenan.** Pp. viii + 407. British Museum (Natural History), London. 1983. £15.
A bold and successful attempt to provide a much-needed comprehensive and up-to-date directory of local and national societies, with geographical and subject guides, etc. Inevitably such a work will rapidly date; because of this in-built obsolescence, would it not have been better to publish this most useful work either as a cheaper paperback or in ring-binder format capable of up-dating? Up-dated and revised editions are promised, but local society secretaries, who would especially benefit from these, may find such replacements too costly an exercise.

Enviromental Science Methods edited by **Robin Haynes.** Pp. x + 404, with numerous figures, b/w plates and tables. Chapman and Hall. 1982. £20 hardback, £9.95 paperback.
As with many multi-author volumes, the contributed chapters are highly variable, ranging from GCE 'O' level to undergraduate level. Although some chapters (e.g. mathematics, statistics, and remote sensing) are useful and reasonably stimulating, several are superficial (e.g. computing, microscopy, and laboratory techniques), and fieldwork is poorly treated. In general

the book is disappointing, without inspiration, and fails to unify an increasingly popular subject area which is still in need of integration: the contents do not achieve the editor's stated claim that the book provides 'a web of related principles rather than isolated techniques'.

A Key to the Lichen-forming, Parasitic, Parasymbiotic and Saprophytic Fungi Occurring on Lichens in the British Isles by **D. L. Hawksworth.** Pp. 44, plus blank interleaves. British Lichen Society. 1983. £5 (including postage) from: Mr P. W. Lambley, Castle Museum, Norwich NR1 3JU.
A well-prepared key (reprinted from *The Lichenologist* with special illustrated cover) to a hitherto neglected group of fungi, many of which are common and widespread on lichens. An artificial key for the identification of 218 taxa reported as occurring in the British Isles is supplemented by line-drawings of spores of 141 selected species and a useful index. Author and publisher are to be complimented on the scholarship and presentation of the publication which will be of particular use to lichenologists and mycologists.

Climatological Maps of Great Britain by **E. J. White** and **R. I. Smith.**
Pp. 37, including 23 maps. Institute of Terrestrial Ecology, Penicuik, Midlothian. 1982. £2. paperback.
Valuable data poorly presented: maps which would otherwise be most helpful in the interpretation of plant and animal distributions are difficult to evaluate due to format, scale, reference points and particularly the wishy-washy colouring employed.

The Vegetative Key to Wild Flowers by **Francis Rose.** Pp. 48, with numerous line drawings. Warne. £1.95 paperback.
Reprinted from *The Wild Flower Key* (see *Naturalist* **107:** 38-39): an effective route to the identification of plants not in flower.

Man and the Natural World. Changing Attitudes in England 1500-1800 by **Keith Thomas.** Pp. 426, including several text illustrations. Allen Lane. 1983. £14.95.
A highly enjoyable and informative work based on extensive scholarly research as testified by the impressive 100-page section of bibliographical notes. An exceptionally wide-ranging survey of man's attitudes to plants and animals, likely to appeal to a broad spectrum of readers both scientific and non-scientific.

The Parasitic Copepoda and Branchiura of British Freshwater Fishes. A Handbook and Key by **Geoffrey Fryer.** Pp. 87, including 96 line drawings. 1982. FBA Scientific Publication No. 46. Available from: Freshwater Biological Association, The Ferry House, Far Sawrey, Ambleside, Cumbria LA22 0LP. £3.50 paperback.

CONTRIBUTORS

INDEX

LETTER TO THE EDITOR

Dear Sir,

In 1963 Liverpool Museum purchased the library and papers of Arthur Dallman (1883-1963), who edited the *North-Western Naturalist* from 1926 to 1956 and taught biology for more than 20 years at Mexborough Grammar School. One of the oldest books in Dallman's library was a copy of John Wilson's *A synopsis of British plants in Mr Ray's Method* (1744) which originally belonged to William Gawthorp of Ripley. The book contains numerous annotations by Gawthorp, dated from 1746 onwards, which gave exact localities for many of the plants he observed around Ripon, Pateley Bridge and Ripley, together with some from further afield (e.g. Settle, Knaresborough).

The manuscript material contained in the book has not, to my knowledge, been previously published or quoted. One of the problems in making use of this information is that the scientific names of the plants are given as pre-Linnaean polynomials or phrase-names. However, the English names are usually sufficient for the identification of the species. A brief examination of the localities of some of the rarer species mentioned by Gawthorp, where these can be placed within a 10 km square with certainty, has shown that some of the records are not given in the *Atlas of the British Flora*. There appears to be a worthwhile research project here for a local naturalist interested in studying changes in plant distribution over the last 140 years.

Ref: *The papers of A. A. Dallman (1883-1963)*, by B. D. Greenwood, publ. in *J. Soc. Bibl. Nat. Hist.* 8(2):176-179, 1977.

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